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SELENOCENTRIC CONTROL SYSTEM (1979)

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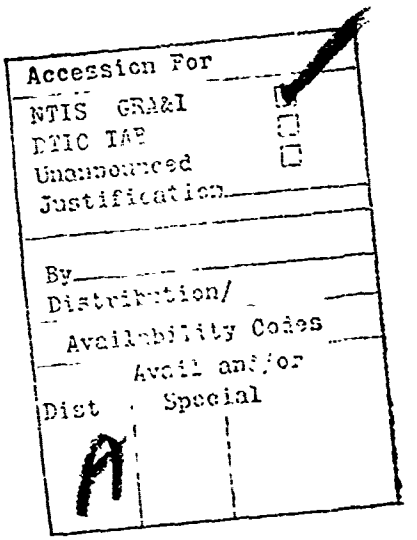

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I. INTRODUCTION

A new set of lunar coordinates has been derived from earthbased observations which consist of long exposure plates taken with the 61 inch (155 cm) astrometric reflector of the U. S. Naval Observatory at Flagstaff, Arizona. This photography covers a period of several years (Table 1) so as to offer a selection of quality and librational differences necessary to selenodetic work. Also, the telescopic aperture is the largest in lunar control studies and the increased resolution results in greater observational accuracy.

A notable defect among earthbased lunar control systems is the lack of common points as a result of each investigator independently selecting features to be measured. This has made analysis, comparisons and unification of different solutions a difficult and questionable task. To remedy this situation, Commission 17 of the I.A.U. has compiled a list of standard control features for all future investigators to include in their work. This standard set is referred to in this paper as the I.A.U. list. The new lunar control system contains 1156 points and has a significant number of common features with other major control systems, the I.A.U. list and analytical triangulations based on the Apollo Mapping Camera Missions (Table 2).

The large number of features in this basic control network have a dual purpose. The first is to give the best overall coverage of the earth-side hemisphere including the determination of feature coordinates as far into the limb regions as possible. Secondly, the large number of points common to other systems, particularly the Apollo Mapping Camera System, will be useful in developing a unified lunar control network.

Another feature of this control system is the determination of approximately 750 limb positions. These are measured positions along the illuminated limb of each plate which were reduced simultaneously with the feature coordinates. The results are radius vectors to all parts of the lunar limb areas and a good approximation of their latitudes and longitudes. These limb positions should be useful in determining the figure of the moon as well as extrapolating control onto the lunar farside with Lunar Mission photography.

II. DESCRIPTION OF THE SYSTEM

This lunar control solution is based upon the concept that the three-dimensional coordinates of a feature are implied from its change in position as the moon exhibits librations. The observation data consists of sets of measured plate coordinates from photographs taken in different parts of the librational cycle. As such, they reflect a two-dimensional projection of the three-dimensional moon as seen from different perspective viewpoints. Detection of the differential effects caused by the unique position of each feature (latitude, longitude and radius vector) is dependent upon the angular separation of views caused by librational differences.

Table 1

Lunar Plates Used for Lunar Control

Plate Number	Date	Universal Time	Librations*		Exp. Time (Seconds)	Age (Days)
			Longitude	Latitude		
4027	16 Apr 65	$07^h58^m35^s$	$5^\circ.202$	$4^\circ.015$	50	14.3
5402	11 Sep 65	07 11 45	-3.576	7.012	30	15.5
8778 C	2 Aug 66	08 15 50	1.772	7.290	30	15.1
9991 I	24 Feb 67	07 35 15	-3.141	-5.875	90	14.9
28533 D	1 Sep 74	06 45 33	-1.811	-5.831	24	14.4
28799 B	1 Oct 74	07 35 32	-3.908	-5.701	24	15.2
29040 A	30 Nov 74	08 11 01	-4.079	0.973	30	16.3
29331 C	27 Jan 75	06 49 28	-2.536	5.605	18	14.9
30131 C	25 May 75	07 59 17	4.841	0.335	24	14.0
33553 C	8 Sep 76	07 13 37	4.242	-4.721	12	13.8

*Combined optical, physical and topocentric librations.

Table 2

Number of Control Features Common to Other Systems

Kiev (Gavrilov)	276	common	features
Manchester (Mills)	305	"	"
Schrutka I	113	"	"
I.A.U. List	199	"	"
Apollo	300	"	"

Libration in latitude is the result of the inclination of the moon's equator to its orbital plane and has a fairly consistent maximum value of about 6.7 degrees. The libration in longitude is more complex and basically the result of a constant lunar rotation rate in contrast to a variable orbital velocity. Another contributing factor is the location of the earth near one foci rather than at the center of the lunar orbit. Due to certain perturbations (evection and variation), the maximum libration in longitude varies between five and eight degrees. Thus, two observations taken from opposite quadrants at instances of maximum libration in latitude and longitude could result in an angular separation of 20 degrees. However, this is not a common occurrence and it is more practical to expect librational differences of about 15 degrees or less.

In the development of a fundamental lunar control system, there is a problem with the variation in the librations in longitude. Maximum librations occur when the moon is near first and last quarter while minimum values are associated with new and full phase. Since a fundamental system cannot be derived from quarter or slightly gibbous photography, the maximum librations in longitude (seven to eight degrees) cannot be utilized. The observations in this control system consist of full and near full phase photography and are limited to maximum longitudinal librations of five to six degrees.

The major influence of the geometry or angular separation of different observations is to effect the magnitude of error in the earthward coordinate. This is the largest coordinate error and its value increases as the angular separation decreases. While the use of near full phase photography cannot make use of maximum librations, it compensates by providing a homogeneous set of observations.

This reduction was done by the stereographic method using the perspective ray technique. Each observation is considered a conical projection of rays from the observer's position through the control features and intersecting a plane which passes through the origin of the lunar control system perpendicular to the observer's line of sight. The perspective rays from two or more differently librated observations will intersect at the feature's surface position provided no errors are present. In practice, the errors are minimized as much as possible and the point which is closest to the maximum convergence of the perspective rays is considered the most probable position.

Coordinates in this control system are referred to an origin at the center of figure and not the more desirable center of mass. Plate constants (rotation, translation and scale) were determined by a least squares fit between the measurements and previously established coordinates of 60 control features. These features were accepted as fundamental points for the purpose of establishing the parameters of the new lunar control system. Since their positional values were taken from the ACIC Lunar Control System 1965 (Meyer & Ruffin, 1965) which was related to the center of figure origin as determined by heliometer measurements of the crater Mosting A, the new control system is also referred to a center of figure origin.

There are two errors associated with the development of plate constants. The first is relating the various observations to slightly different origins and coordinate axes. This effect has been minimized by using the same large sample (60 control features) of well dispersed points for all observations. The second error occurs because the moon librates about the center of mass rather than the center of figure. For each librated observation, the positional values are rotated about a false center before a mathematical comparison is made with the proper array as depicted by the photograph. There are slight differential errors present whose magnitude depends upon the size of the displacement between the center of mass and the center of figure being used as the origin.

The coordinates of the 60 control points (Table 3) used to determine plate constants have been related to a new origin as a result of an improved determination of the coordinates of Mosting A (Koziel, 1967). The major change in the center of figure origin was a translation of over a kilometer in the earthward direction. Some studies have indicated that this is the direction of the moon's center of mass with respect to the center of figure. Hence the translation should result in improved coordinates. This has been confirmed by the RMS values derived from developing the plate constants for various librated observations. In every case tested, these values diminished. This strongly indicates that the translation to the new origin has removed some of the differential errors in the coordinates.

Another improvement in this new control system concerns the librations. Those previously described are called optical librations and must be amended by two other factors. One is a small correction caused by the observatory's surface position at the time of observation (topocentric librations). The other is an actual physical libration or rotation caused by the earth's gravitational attraction. In the past, these physical libration values have been estimated from theory since they were too small to be observed or measured using earthbased telescopic observations. However, the physical librations which have been incorporated into this work are based on the more accurate results obtained from a recent analysis of lunar laser ranging data (Williams, 1977).

III. OBSERVATIONS

Measurements were made on long exposure plates taken at or near full moon phase with the 61 inch (155 cm) astrometric reflector of the U.S. Naval Observatory at Flagstaff, Arizona. The selection of photography was from two separate efforts covering different time periods. The first series began in August 1964 and was terminated in November 1967. A recent series in support of the present work began in June 1974 and is still in progress. All pertinent data concerning the selected plates are listed in Table 1.

Due to the nature of the lunar libration cycle, it requires about four years to obtain near maximum librations in all quadrants. This requires a coincidence of several events which have a tendency to expand the acquisition time. On an average, there are eight to ten nights a year when the moon is near maximum libration at the desired phase which must also be accompanied by clear skies and good seeing. These events cannot be expected to occur on a regular basis, thus extending the time period necessary to obtain an optimum array of librations.

Table 3

Primary Lunar Control Features

No.	Name	Latitude	Longitude	Radius Vector
1	Reiner A	5°.151	-51°.450	1735.90 km
2	Herodotus A	21.537	-52.895	1735.54
3	Brayley D	20.031	-32.821	1737.14
4	Draper C	17.074	-21.474	1736.79
5	Hortensius C	5.941	-26.686	1737.61
6	Lansberg A	.190	-31.100	1737.13
7	Gambart G	1.961	-12.020	1737.24
8	Mosting A	-3.182	-5.166	1738.48
9	Bruce	1.183	.396	1738.12
10	Manilius D	13.244	7.001	1737.86
11	Aratus	23.605	4.533	1738.40
12	Eratosthenes B	18.705	-8.672	1737.07
13	Timocharis F	31.291	-14.755	1736.47
14	Carlini A	35.358	-26.592	1735.98
15	Mairan E	37.807	-37.193	1735.83
16	Sharp A	47.624	-42.639	1736.11
17	Maupertuis L	51.342	-29.224	1736.22
18	Plato G	52.153	-6.253	1736.97
19	Piton B	39.364	-.140	1735.58
20	Egede A	51.575	10.523	1735.73
21	Baily K	51.509	30.549	1735.41
22	Plana D	41.765	26.179	1737.19
23	Cepheus A	41.062	46.531	1736.53
24	Posidonius A	31.698	29.513	1735.98
25	Linne B	30.546	14.183	1735.45
26	Bessel A	24.770	21.015	1735.10
27	Silberschlag A	6.950	13.221	1737.89
28	Horrocks M	-4.040	7.628	1738.45
29	Abulfeda Q	-12.823	12.238	1738.32
30	Argelander D	-17.608	4.463	1737.99

Table 3 (Cont'd)

Primary Lunar Control Features

No.	Name	Latitude	Longitude	Radius Vector
31	Alpetragius H	-17°.982	-6°.068	1736.24 km
32	Opelt K	-13.580	-17.049	1737.12
33	Euclides D	-9.374	-25.757	1736.91
34	Wichmann B	-7.115	-39.146	1736.88
35	Flamsteed D	-3.168	-44.846	1736.95
36	Damoiseau E	-5.203	-58.341	1736.06
37	Zupus A	-17.206	-53.478	1737.34
38	De Gasparis B	-27.021	-52.552	1737.86
39	Doppelmayer T	-24.494	-41.124	1735.99
40	Ramsden A	-33.453	-31.360	1737.57
41	Lehmann H	-40.979	-58.632	1737.79
42	Schiller A	-47.128	-37.548	1737.34
43	Longomontanus R	-52.375	-26.225	1737.53
44	Lippershey T	-25.255	-11.096	1736.57
45	Aliacensis D	-33.131	6.864	1737.94
46	Cuvier C	-49.967	11.772	1737.39
47	Nicolai A	-42.439	23.620	1737.32
48	Janssen K	-46.159	42.308	1735.12
49	Rheita P	-37.924	44.466	1737.99
50	Cook B	-17.297	51.705	1736.49
51	Messier A	-1.995	46.976	1735.52
52	Picard X	13.143	61.770	1733.17
53	Tralles B	27.275	50.675	1736.89
54	Maraldi B	14.364	36.796	1736.41
55	Maskelyne H	4.915	32.276	1736.86
56	Moltke	-.568	23.184	1736.40
57	White Spot-Daguerre	-11.753	33.127	1735.04
58	Beaumont G	-20.349	27.165	1737.64
59	Sacrobosco C	-22.962	15.843	1737.40
60	Rothmann K	-28.822	24.364	1738.88

Uncertainties in the observations can be placed in two categories. One is in the measurement of the features. This includes the difference in interpretation of the feature on plates of different libration, phase and resolution, as well as the error in measurement. It may also include some physical parameters such as the symmetry of the feature and the contrast with its surroundings. The other category is the recording of the lunar image. This includes the atmospheric, optical and photographic effects which disturb the true positioning of the feature's image. Most uncertainties can be effectively reduced by established procedures, calibration and careful measurement. However, one source of positional error that is difficult to control or remove is the atmospheric distortion of images in the focal plane of the telescope. Light rays passing through the various and changing layers of the earth's atmosphere have different refractive histories when they reach the telescope. This results in image motion and blurring. A short exposure lunar photograph records the moving image in some part of its random cycle which may produce geometric distortions of considerable magnitude. It has been shown that these distortions are larger than the differential displacements that must be observed to derive accurate positions (Meyer, 1967).

The long exposure photographs used in this work serve two useful purposes. First, and most important, they allow the image motion to be averaged photographically on the plate. Bright craters used as control points are surrounded by a light area which is the result of image motion during exposure. The center of this image is a more accurate position than can be obtained from short exposures. Secondly, the long exposure allows very small or faint features to register a measurable image. This is important in relating the small scale (1:25,000,000) earthbased images to identical features on the larger scale (1:1,500,000) Apollo mapping photography.

Another observational factor often ignored in theoretical dissertations on lunar control is the actual resolving power of the telescopes used for selenodetic work. The theoretical limit of the 61 inch (155 cm) astrometric is about 0.08 second which is considerably smaller than the resolution of other instruments used for lunar control. However, the atmosphere will not allow telescopes to achieve their theoretical resolution or larger telescopes to obtain the full advantage over smaller telescopes as indicated by theoretical resolutions. Stellar images which should be mere points of light as a result of their great distances are normally observed in the focal plane as discs of two to four seconds of arc during good to average seeing. The resolution limit imposed by the atmosphere is about 0.2 second of arc and this is primarily for visual observations. The eye can capture brief moments of extreme atmospheric steadiness which cannot be anticipated for photography.

Larger apertures do maintain a resolution capability greater than smaller telescopes though not in the amounts indicated by theoretical limits. This is demonstrated by excellent lunar photography taken with large reflectors, particularly the 120 inch (305 cm) reflector at the Lick Observatory in California. The same is evident in an analysis of common features between the photography of the 61 inch (155 cm) reflector and the Apollo Mapping Camera System. Many of these features are craters about one to two kilometers in diameter which represent a resolution of one second of arc or less. This offers an opportunity for a more accurate set of measured plate coordinates than in previous lunar control solutions.

Measurements were made on a Mann linear comparator having orthogonal lead screws for measuring the rectangular coordinates in one micrometer increments. These coordinates were automatically recorded on punched cards with the digitizer giving a visual display of these values. The comparator has a plate holder which permits angular rotations within the precision of a 20 second vernier and a gridded calibration plate for quality control.

The first step in the measuring program was to orient each plate so that the Y axis of the comparator closely coincided with the direction of the atmospheric refraction correction. In this manner, the effect of mean atmospheric refraction appears in only one comparator coordinate simplifying the correction process. Also, the transformation of measurements to lunar coordinates (Part IV - REDUCTIONS) was second order and affine which allowed the X and Y scales to vary by small amounts. This tends to minimize the effect of differences between the mean and actual refraction.

The plate was also positioned so that the selenocentric coordinates of the observatory coincided with the center of rotation of the comparator stage. The plate holder was then rotated until a preselected feature, the crater Egede A, lies on the Y axis. The plate was then rotated so that the Y axis corresponded to the arc from the observer's zenith through the moon's center (Figure 1). This rotation was determined as follows:

θ = Plate rotation angle from the crater Egede A.

Q = Parallatic angle in the plane of libration between the direction of the observer's zenith and the celestial north pole.

C_o = The position angle of the lunar north pole relative to the celestial north pole.

X_p, Y_p = Perspective coordinates of the crater Egede A in the librated plane.

θ, Q and C_o angles are positive in the counter-clockwise direction. θ is computed using the equation,

$$\theta = Q - C_o + \tan^{-1} \quad (X_p/Y_p) \tag{1}$$

The values of Q and C_o were derived from the topocentric corrections of the lunar librations (8) and the perspective coordinates are defined by (10).

After the plate had been oriented, the 1156 control features were measured along with the limb positions. In the near full phase, the limb was illuminated by more or less tangential sunlight. The long exposure allowed the limb areas to be adequately defined for measurement. To remove the measuring bias of the operator, the plate holder was rotated 180 degrees and the control features remeasured. A least square transformation was performed

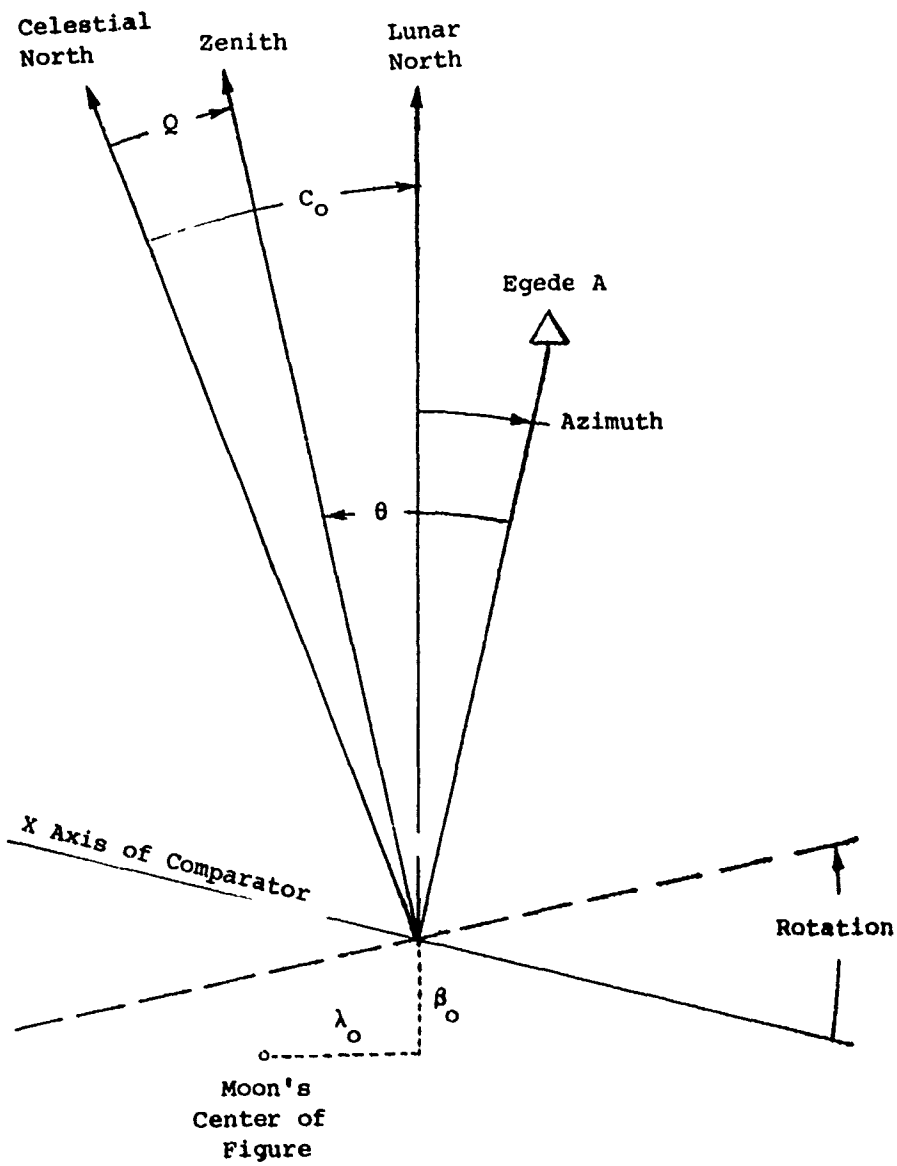

Figure 1. Plate Rotation

to convert the reversed plate measurements to the first set and the actual plate measurements are an average of these values.

The following equations are used:

X_1, Y_1 = Standard set readings

X_2, Y_2 = Reversed set readings to be transformed

X_1^1, Y_1^1 = Standard set centroid values

X_2^1, Y_2^1 = Centroid values to be transformed

X_3, Y_3 = Transformed plate readings

X_M, Y_M = Averaged plate readings

θ = Rotation angle

C_X, C_Y = Translation factors

N = Number of craters measured = 1156

d_X, d_Y = Residual errors of transformation

then

$$X_1 = AX_2 - BY_2 + C_X$$

$$Y_1 = AY_2 + BX_2 + C_Y$$

$$A = \cos\theta = \frac{\sum(X_2^1X_1^1) + \sum(Y_2^1Y_1^1)}{\left(\left[\sum(X_2^1X_1^1) + \sum(Y_2^1Y_1^1)\right]^2 + \left[\sum(X_2^1Y_1^1) - \sum(X_1^1Y_2^1)\right]^2\right)^{1/2}}$$

$$B = \sin\theta = \frac{\sum(X_2^1Y_1^1) + \sum(X_1^1Y_2^1)}{\left(\left[\sum(X_2^1X_1^1) + \sum(Y_2^1Y_1^1)\right]^2 + \left[\sum(X_2^1Y_1^1) - \sum(X_1^1Y_2^1)\right]^2\right)^{1/2}}$$

$$C_X = \frac{-A\sum X_2 + B\sum Y_2 + \sum X_1}{N}$$

$$C_Y = \frac{-A\sum Y_2 - B\sum X_2 + \sum Y_1}{N} \qquad (2)$$

and

$$\text{Scale} = (A^2 + B^2)^{1/2} = 1$$

$$X_1 = X_3 + d_X$$

$$Y_1 = Y_3 + d_Y$$

For each plate transformation, the program rejects any point with large d_X or d_Y residuals. This is to prevent feature misidentification or measuring blunders between the zero degree and the 180 degree plate orientations. A standard error (S.E.) was determined for each set of plate measurements and the average for all plates was 10 micrometers. Differences between this average and the individual plate errors were less than 2 micrometers. Therefore, all plate measurements were weighted uniformly in the reductions. The standard error was determined using the following equation:

$$\text{S.E.} = \left(\frac{\sum d_X^2 + \sum d_Y^2}{2N - 1} \right)^{1/2} \tag{3}$$

The actual plate measurements (X_M, Y_M) are the mean of the standard set (X_1, Y_1) and the transformed set (X_3, Y_3). The next step was to correct the Y_M values for atmospheric refraction since the plate was oriented so that the corrections were applied only to these coordinates. This correction was considered to be linear as the moon subtends an arc of only half a degree when viewed from the earth. The following notations were used:

Z = Geocentric zenith distance

M = Index of refraction at observatory (mean)

S = Semidiameter of the moon (seconds of arc)

Y_u = Y coordinate of upper limb (measured)

R_u = Refraction of upper limb

R_l = Refraction of lower limb

R_d = Refraction difference between limbs

X_o, Y_o = Corrected plate coordinates

then

$$R_u = 206265\ (M-1) \tan (Z-S)$$

$$R_l = 206265\ (M-1) \tan (Z+S)$$

$$R_d = R_l - R_u \tag{4}$$

The value for Z is derived in the libration computation (Part IV - REDUCTIONS) and S is interpolated from the American Ephemeris and Nautical Almanac using second differences. R_d gives the refraction difference in seconds of arc. Treating this difference as being distributed linearly from the lower to the upper limb, the ratio $R_d/2S$ can be used to compute corrected plate coordinates as follows:

$$Y_o = Y_M + (R_d/2S) \quad (Y_u - Y_M) \tag{5}$$

All the Y_M measures are corrected in this manner where the upper limb is taken as the reference to which all values are adjusted. Since refraction in the horizontal direction is considered negligible, $X_o = X_M$.

The work on observations was completed when all of the differently librated plates had been processed through the above operations. This minimized the measuring bias, seeing displacements caused by the atmosphere and the differential effects of atmospheric refraction. Although some errors remain, they are reduced by reduction procedures and the over-determination of feature coordinates. The plate coordinates (X_o, Y_o) thus represents a conical projection of the surface features on the photo plane and are ready to be used for lunar coordinate determination.

IV. REDUCTIONS

The first step in the reduction procedure was to relate the measured plate coordinates (X_o, Y_o) to a lunar reference system. That is, a three-dimensional rectangular coordinate system with the origin at the moon's apparent center of figure and a scale representing the true lunar dimensions. In this system, the Y axis corresponds to the lunar axis of rotation; the Z axis points earthward from the origin through the point of zero degrees latitude and longitude; and the X axis lies in the east-west direction perpendicular to the Y and Z axes. Since the origin is not at the center of mass, systematic differences exist between this type of lunar reference system and a mass centered system.

The purpose of the reduction is to develop a relatively consistent control network that can later be transformed to a mass centered system when the appropriate parameters have been determined. Consistency is accomplished by deriving the plate constants for each plate by a transformation to 60 feature coordinates (Table 3). A few of these preliminary coordinates were amended as a result of systematic differences with the measured values. This resulted in a more relatively consistent set of preliminary coordinates but not necessarily an adjustment to better absolute values.

For each plate, the 60 control points were rotated about the coordinate axes to correspond to the observatory's perspective or topocentric librations. Then a perspective displacement was computed for each of the 60 feature coordinates based on its librated position. The result was a conical projection of these features onto a plane through the origin that is perpendicular to the observer's line of sight. These perspective coordinates represent a similar array to the plate coordinates (X_o, Y_o) within the limitations of the distortions and measuring errors present.

The first operation was the determination of the optical and physical librations with the LURE 2 program (Williams, 1977) from which the following factors were derived:

α = Geocentric right ascension of the moon

δ = Geocentric declination of the moon

π = Equatorial horizontal parallax

β_E = Selenocentric latitude of the earth

λ_E = Selenocentric longitude of the earth

C = Librated position angle of the lunar axis

The values thus derived refer to the line of centers between the earth and moon and must be amended for the observatory's surface position.

Topocentric librations were determined by the method of Atkinson (Atkinson, 1951). The following notations were used:

ϕ = Geocentric latitude of observatory

λ_{oE} = Longitude of observatory (time)

GHA_γ = Greenwich hour angle

h = Geocentric hour angle of the moon

Z = Geocentric zenith distance of the moon

Q = Parallatic angle in the plane of libration between the direction of the observer's zenith and the celestial north pole

π' = Topocentric parallax

Δb = Topocentric correction to latitude

Δl = Topocentric correction to longitude

Δc = Topocentric correction to position angle

β_o = Selenocentric latitude of observatory

λ_o = Selenocentric longitude of observatory

where

$$\phi = 35°00'08" \text{ (1967 Ellipsoid)}$$

$$\lambda_{oE} = 7^h 26^m 58^s$$

$$h = GHA_\lambda - \lambda_{oE} - \alpha' + 24 \text{ hours}$$

$$Z = \cos^{-1} (\sin \phi \sin \delta + \cos \phi \cos \delta \cos h)$$

$$Q = \sin^{-1} (\sin h \cos \phi \operatorname{cosec} Z)$$

$$\pi' = \pi (\sin Z + 0.0084 \sin 2Z) \qquad (6)$$

then

$$\Delta b = \pi' \cos (Q - C)$$

$$\Delta 1 = \pi' \sin (Q - C) \sec \beta_E \qquad (7)$$

$$\Delta c = \sin \beta_o (\Delta 1) - \pi' \sin Q \tan \delta$$

and

$$\beta_o = \beta_E + \Delta b$$

$$\lambda_o = \lambda_E + \Delta 1 \qquad (8)$$

$$C_o = C + \Delta c$$

When the topocentric librations are known, a rotation matrix can be used to determine each of the 60 feature coordinates in this sytem:

β_p = Selenocentric latitude of point

λ_p = Selenocentric longitude of point

R = Radius vector of point

and

X_L, Y_L, Z_L = Coordinates of point in topocentric system

then

$$X_L = R \left[\cos \beta_p \sin (\lambda_p - \lambda_o)\right]$$

$$Y_L = R \left[\cos \lambda_o \sin \beta_p - \sin \beta_o \cos \beta_p \cos (\lambda_p - \lambda_o)\right]$$

$$Z_L = R \left[\sin \beta_o \sin \beta_p + \cos \beta_o \cos \beta_p \cos (\lambda_p - \lambda_o)\right] \qquad (9)$$

It is then necessary to determine the conically projected or perspective coordinates of each control feature in the librated plane:

R_M = Distance between centers of earth and moon

R_o = Distance from observatory to moon's center

R_v = Geocentric radius of U. S. Naval Observatory (6373.377 km)

a = Equatorial radius of earth (6378.160 km)

d_x, d_y = Perspective displacements

X_{LP}, Y_{LP} = Perspective coordinates of point

then

$$R_M = \frac{a}{\sin \pi}$$

$$R_o = \frac{R_M - R_v \cos Z}{\cos \Delta b \cos \Delta l}$$

$$dx = Z_L\left(\frac{X_L}{R_o - Z_L}\right)$$

$$dy = Z_L\left(\frac{Y_L}{R_o - Z_L}\right)$$

$$X_{LP} = X_L + dx$$

$$Y_{LP} = Y_L + dy \qquad (10)$$

Note: X_L and Y_L are increased numerically by dx and dy regardless of sign.

The adjusted plate coordinates (X_o, Y_o) of the 60 control features can now be transformed into projected lunar coordinates (X_{LP}, Y_{LP}). This will develop a set of plate constants or parameters which relate the measured coordinates to a lunar reference system as depicted by the control features. A second order affine transformation was used.

$$X_{LP} = A_1 X_o - B_1 Y_o + C_1(X_o^2 - Y_o^2) - D_1(2X_o Y_o) + C_E$$

$$Y_{LP} = A_2 Y_o + B_2 X_o + C_2(2X_o Y_o) + D_2(X_o^2 - Y_o^2) + C_N \qquad (11)$$

Since this is an affine transformation, it will differ from a similar conformal transformation as follows:

Conformal $A_1 = A_2, B_1 = B_2, C_1 = C_2$, etc.

Affine $A_1 \approx A_2, B_1 \approx B_2, C_1 \approx C_2$, etc.

There will be small differences in the coefficients in the affine transformation since the Y scale may be slightly different than the X scale.

The method of least squares using the centroid technique was employed to determine the coefficients in equations (11) where

X_o and Y_o = Plate coordinates

X and Y = Centroid plate coordinates

X_{LP} and Y_{LP} = Perspective coordinates

X_p and Y_p = Centroid perspective coordinates

N = Number of points (60)

Then for each point:

$$X = X_o - \frac{\sum X_o}{N}$$

$$Y = Y_o - \frac{\sum Y_o}{N}$$

and

$$X_p = X_{LP} - \frac{\sum X_{LP}}{N}$$

$$Y_p = Y_{LP} - \frac{\sum Y_{LP}}{N} \qquad (12)$$

Then the normal equations are as follows:

For X

$$\begin{bmatrix} \sum X \cdot X & -\sum X \cdot Y & \sum X(X^2-Y^2) & -\sum X \cdot 2XY \\ -\sum Y \cdot X & \sum Y \cdot Y & -\sum Y(X^2-Y^2) & \sum Y \cdot 2XY \\ \sum (X^2-Y^2)X & -\sum (X^2-Y^2)Y & \sum (X^2-Y^2)(X^2-Y^2) & -\sum (X^2-Y^2)2XY \\ -\sum 2XY \cdot X & \sum 2XY \cdot Y & -\sum 2XY(X^2-Y^2) & \sum 2XY \cdot 2XY \end{bmatrix} \cdot \begin{bmatrix} A_1 \\ B_1 \\ C_1 \\ D_1 \end{bmatrix} = \begin{bmatrix} \sum X \cdot x_p \\ -\sum Y \cdot x_p \\ \sum (X^2-Y^2)x_p \\ -\sum 2XY \cdot x_p \end{bmatrix} \qquad (13)$$

For Y

$$\begin{bmatrix} \sum Y \cdot Y & \sum Y \cdot X & \sum Y \cdot 2XY & \sum Y(X^2-Y^2) \\ \sum X \cdot Y & \sum X \cdot X & \sum X \cdot 2XY & \sum X(X^2-Y^2) \\ \sum 2XY \cdot Y & \sum 2XY \cdot X & \sum 2XY \cdot 2XY & \sum 2XY(X^2-Y^2) \\ \sum (X^2-Y^2)Y & \sum (X^2-Y^2)X & \sum (X^2-Y^2)2XY & \sum (X^2-Y^2)(X^2-Y^2) \end{bmatrix} \cdot \begin{bmatrix} A_2 \\ B_2 \\ C_2 \\ D_2 \end{bmatrix} = \begin{bmatrix} \sum Y \cdot Y_p \\ \sum X \cdot Y_p \\ \sum 2XY \cdot Y_p \\ \sum (X^2-Y^2)Y_p \end{bmatrix}$$

Both matrices were inverted to derive the eight unknown coefficients. Then the translation factors are:

$$C_E = \frac{\sum X_{LP} - A_1 \sum X_o + B_1 \sum Y_o - C_1 \sum (X_o^2 - Y_o^2) + D_1 \sum 2X_o Y_o}{N}$$

$$C_N = \frac{\sum Y_{LP} - A_2 \sum Y_o - B_2 \sum X_o - C_2 \sum 2X_o Y_o - D_2 \sum (X_o^2 - Y_o^2)}{N} \qquad (14)$$

The eight coefficients and two translation factors were applied to the plate coordinates according to the transformation formula (11). This produced a set of transformed coordinates (X_T and Y_T) for each control point which differs from their perspective coordinates (X_{LP} and Y_{LP}) by the amount of the residual errors (E_X and E_Y):

$$E_X = X_{LP} - X_T$$

$$E_Y = Y_{LP} - Y_T \qquad (15)$$

The standard error (S.E.) will be

$$S.E. = \left(\frac{\sum E_X^2 + \sum E_Y^2}{2N - 4} \right)^{1/2} \qquad (16)$$

The plate coordinates of the unknown points were then transformed into the librated plane by the above equations (11). In subsequent computations, the transformed coordinates X_T and Y_T were used for both control points and unknown points. This developed new positions for the control features as amended by actual measurements. For a few of these control features, the residual errors (E_X and E_Y) were large and consistent from plate to plate. In these cases, the positions derived from the X_T and Y_T were substituted for the original coordinates and the computations iterated.

The next step was to compute the direction cosines of the perspective ray of each point and convert its transformed coordinates (X_T and Y_T) into three-dimensional selenocentric coordinates. It was necessary to compute the selenocentric directions of the perspective rays. These are the directions in

latitude and longitude that a ray parallel to the perspective ray would take if it passed through the origin of the selenocentric reference system. This procedure is as follows:

β_{op} = Selenocentric direction in latitude

λ_{op} = Selenocentric direction in longitude

R_o = Distance from observatory to moon's center

Δb_o = Correction to β_o for each point's position

Δl_o = Correction to λ_o for each point's position

then

$$\Delta b_o = \tan^{-1}\left(\frac{X_T}{R_o}\right)$$

$$\Delta l_o = \tan^{-1}\left(\frac{Y_T}{R_o}\right)$$

and

$$\beta_{op} = \beta_o - \Delta b_o$$

$$\lambda_{op} = \lambda_o - \Delta l_o \qquad (17)$$

Δl_o and Δb_o will have the same sign as X_T and Y_T, respectively. Then the direction cosines (α_p, β_p, and λ_p) for each ray are:

$$\cos \alpha_p = \cos \lambda_{op} \cos \beta_{op}$$

$$\cos \beta_p = \sin \lambda_{op} \cos \beta_{op}$$

$$\cos \lambda_p = \sin \beta_{op} \qquad (18)$$

Converting the transformed coordinates into the selenocentric reference system required a rotation about two axes. The first was the reverse of the libration β_o and the second was the reverse of the libration λ_o. It was not necessary to change the sign of β_o since the sign of the libration in latitude is opposite the sign of rotation:

X_s, Y_s, Z_s = Selenocentric coordinates of X_T, Y_T

β_o = First rotation about the X axis

$-\lambda_o$ = Second rotation about the Y axis

The rotation matrix is:

$$\begin{bmatrix} X_s \\ Y_s \\ Z_s \end{bmatrix} = \begin{bmatrix} \cos\lambda_o & - & \sin\beta_o \sin\lambda_o & + & \cos\beta_o \sin\lambda_o \\ 0 & + & \cos\lambda_o & + & \sin\beta_o \\ -\sin\lambda_o & - & \sin\beta_o \cos\lambda_o & + & \cos\beta_o \cos\lambda_o \end{bmatrix} \begin{bmatrix} X_T \\ Y_T \\ Z_T \end{bmatrix}$$

Since there are no values for Z_T, this reduces to:

$$\begin{aligned} X_s &= X_T\cos\lambda_o - Y_T\sin\beta_o \sin\lambda_o \\ Y_s &= Y_T\cos\lambda_o \\ Z_s &= -X_T\sin\lambda_o - Y_T\sin\beta_o \cos\lambda_o \end{aligned} \qquad (19)$$

This operation ends the reduction procedure on the individual plate. Each of the 1156 control features were related to the selenocentric reference system through direction cosines and the coordinates X_s, Y_s and Z_s.

The surface position of each point, latitude, longitude and radius vector was computed from sets of three differently librated plates. The result of this computation was three sets of coordinates, one on each perspective ray. They form a triangle in space and the most probable surface position is considered an average of the three values. For each computation, the subscripts 1, 2 and 3 are used to identify similar values on the differently librated plates:

X_{s1}, Y_{s1}, Z_{s1} = Selenocentric coordinates of the intersection of the perspective ray and the librated plane on plate no. 1.

$\alpha_2, \beta_2, \gamma_2$ = Direction cosines of the perspective ray on plate no. 2.

etc....

The differences between the three projected space coordinates of a point are:

$$\begin{aligned} \Delta X_1 &= X_{s2} - X_{s1} & \Delta X_2 &= X_{s3} - X_{s1} \\ \Delta Y_1 &= Y_{s2} - Y_{s1} & \Delta Y_2 &= Y_{s3} - Y_{s1} \\ \Delta Z_1 &= Z_{s2} - Z_{s1} & \Delta Z_2 &= Z_{s3} - Z_{s1} \end{aligned}$$

$$\begin{aligned} \Delta X_3 &= X_{s3} - X_{s2} \\ \Delta Y_3 &= Y_{s3} - Y_{s2} \\ \Delta Z_3 &= Z_{s3} - Z_{s2} \end{aligned} \qquad (20)$$

Each point has the following observation equations:

L_1, L_2, L_3 = Distance along the perspective ray from the librated plane to the surface position for each point

X_{sp}, Y_{sp}, Z_{sp} = Mean selenocentric surface coordinates for each point

and

$$
\begin{aligned}
L_1\cos\beta_1 - L_2\cos\beta_2 &= \Delta X_1 \\
L_1\cos\beta_1 - L_3\cos\beta_3 &= \Delta X_2 \\
L_2\cos\beta_2 - L_3\cos\beta_3 &= \Delta X_3 \\
L_1\cos\gamma_1 - L_2\cos\gamma_2 &= \Delta Y_1 \\
L_1\cos\gamma_1 - L_3\cos\gamma_3 &= \Delta Y_2 \\
L_2\cos\gamma_2 - L_3\cos\gamma_3 &= \Delta Y_3 \\
L_1\cos\alpha_1 - L_2\cos\alpha_2 &= \Delta Z_1 \\
L_1\cos\alpha_1 - L_3\cos\alpha_3 &= \Delta Z_2 \\
L_2\cos\alpha_2 - L_3\cos\alpha_3 &= \Delta Z_3 \qquad (21)
\end{aligned}
$$

Then let:

$$\sum aa = 2(\cos^2\beta_1 + \cos^2\gamma_1 + \cos^2\alpha_1)$$

$$\sum bb = 2(\cos^2\beta_2 + \cos^2\gamma_2 + \cos^2\alpha_2)$$

$$\sum cc = 2(\cos^2\beta_3 + \cos^2\gamma_3 + \cos^2\alpha_3)$$

$$\sum ab = (\cos\beta_1 \cos\beta_2 + \cos\gamma_1 \cos\gamma_2 + \cos\alpha_1 \cos\alpha_2)(-1)$$

$$\sum ac = (\cos\beta_1 \cos\beta_3 + \cos\gamma_1 \cos\gamma_3 + \cos\alpha_1 \cos\alpha_3)(-1)$$

$$\sum bc = (\cos\beta_2 \cos\beta_3 + \cos\gamma_2 \cos\gamma_3 + \cos\alpha_2 \cos\alpha_3)(-1)$$

$$\sum al = \cos\beta_1 (\Delta X_1 + \Delta X_2) + \cos\gamma_1(\Delta Y_1 + \Delta Y_2) + \cos\alpha_1(\Delta Z_1 + \Delta Z_2)$$

$$\sum bl = \cos\beta_2\ (\Delta X_3 - \Delta X_1) + \cos\gamma_2(\Delta Y_3 - \Delta Y_1) + \cos\alpha_2(\Delta Z_3 - \Delta Z_1)$$

$$\sum cl = -\cos\beta_3\ (\Delta X_2 + \Delta X_3) - \cos\gamma_3(\Delta Y_2 + \Delta Y_3) - \cos\alpha_3(\Delta Z_2 + \Delta Z_3) \tag{22}$$

and

$$\begin{bmatrix} \sum aa & + & \sum ab & + & \sum ac \\ \sum ab & + & \sum bb & + & \sum bc \\ \sum ac & + & \sum bc & + & \sum cc \end{bmatrix} \begin{bmatrix} L_1 \\ L_2 \\ L_3 \end{bmatrix} = \begin{bmatrix} \sum al \\ \sum bl \\ \sum cl \end{bmatrix} \tag{23}$$

The matrix is inverted to derive values for L_1, L_2 and L_3. The mean selenocentric coordinates of the surface position are:

$$X_{sp} = \frac{(L_1\cos\beta_1 + X_{S1}) + (L_2\cos\beta_2 + X_{S2}) + (L_3\cos\beta_3 + X_{S3})}{3}$$

$$Y_{sp} = \frac{(L_1\cos\gamma_1 + Y_{S1}) + (L_2\cos\gamma_2 + Y_{S2}) + (L_3\cos\gamma_3 + Y_{S3})}{3}$$

$$Z_{sp} = \frac{(L_1\cos\alpha_1 + Z_{S1}) + (L_2\cos\alpha_2 + Z_{S2}) + (L_3\cos\alpha_3 + Z_{S3})}{3} \tag{24}$$

and

$$\text{Radius Vector (R)} = (X_{sp}^2 + Y_{sp}^2 + Z_{sp}^2)^{1/2}$$

$$\text{Latitude} = \sin^{-1}\left(\frac{Y_{sp}}{R}\right) \tag{25}$$

$$\text{Longitude} = \tan^{-1}\left(\frac{X_{sp}}{Z_{sp}}\right)$$

In this manner the surface positions were derived for all 1156 control features which constitutes a single determination.

A spherical standard error (S.S.E.) was determined for each control point by comparing the mean coordinates (X_{sp}, Y_{sp}, and Z_{sp}) with the three positions of the triangle. This resulted in nine residuals:

$$\Delta X_1 = X_{sp} - (L_1\cos\beta_1 + X_{s1})$$

$$\Delta Y_2 = Y_{sp} - (L_2 \cos \gamma_2 + Y_{s2})$$

$$\Delta Z_3 = Z_{sp} - (L_3 \cos \alpha_3 + Z_{s3}) \qquad (26)$$

etc. . . .

then

$$N - 3 = 6$$

and

$$\text{S.S.E.} = \left(\frac{\sum \Delta X_i^2 + \sum \Delta Y_i^2 + \sum \Delta Z_i^2}{6} \right)^{1/2} \qquad (27)$$

where i = 1,2,3

In such a large sample of control features (1156), errors are bound to occur in identification, interpretation or actual measurement and the S.E. (27) will depict such discrepancies. A large error then indicates a measuring blunder on one of the three plates for that particular point.

Different sets of three librated plates were carried through equations 20 to 27 to derive coordinate values for all of the control features. Nine of the plates were used in three independent reductions. The tenth plate was combined with plates from two of these reductions for a fourth determination. The final result was a mean of these derived coordinates with a standard error computed similar to steps 26 and 27:

M = Subscript to denote the mean coordinate

N = Number of derived coordinate values

and

$$X_M = \frac{1}{N} \sum X_{spi}$$

$$Y_M = \frac{1}{N} \sum Y_{spi}$$

$$Z_M = \frac{1}{N} \sum Z_{spi} \qquad (28)$$

where ı = 1,N

The mean values for radius vector, latitude, and longitude were determined in a similar manner. The error is then expressed in terms of the X, Y, and Z coordinates where:

$\Delta X, \Delta Y, \Delta Z$ = Differences between the mean coordinates and the individually derived values.

and

$$S.S.E. = \left(\frac{\sum \Delta X_i^2 + \sum \Delta Y_i^2 + \sum \Delta Z_i^2}{N - 3} \right)^{1/2} \quad (29)$$

where i = 1,2,3,4

V. LIMB POSITIONS

After the 1156 control features were measured in the zero degree plate orientation, approximately 60 to 70 positions were measured on the illuminated limb. These limb measurements were carried through the same computations with the control point measurements to step (19). This resulted in the following values being determined for the limb positions:

X_T, Y_T = Transformed perspective coordinates

X_S, Y_S, Z_S = Selenocentric coordinates of the intersection of the perspective ray and librated plane

α, β, γ = Direction cosines of the perspective ray

The reduction of coordinates was accomplished for each individual plate (see Figure 2) where:

D = Distance from the origin to the intersection of the perspective ray and the librated plane

S = Angle at the origin between the normal to the perspective ray and the librated plane.

L = Distance along the perspective ray from the librated plane to the normal or point of tangency.

then

$$D = (X_T^2 + Y_T^2)^{1/2}$$

$$S = \tan^{-1}\left(\frac{D}{R_o}\right)$$

$$L = D \sin S$$

and

$$X_{sp} = L \cos \beta + X_S \quad (30)$$

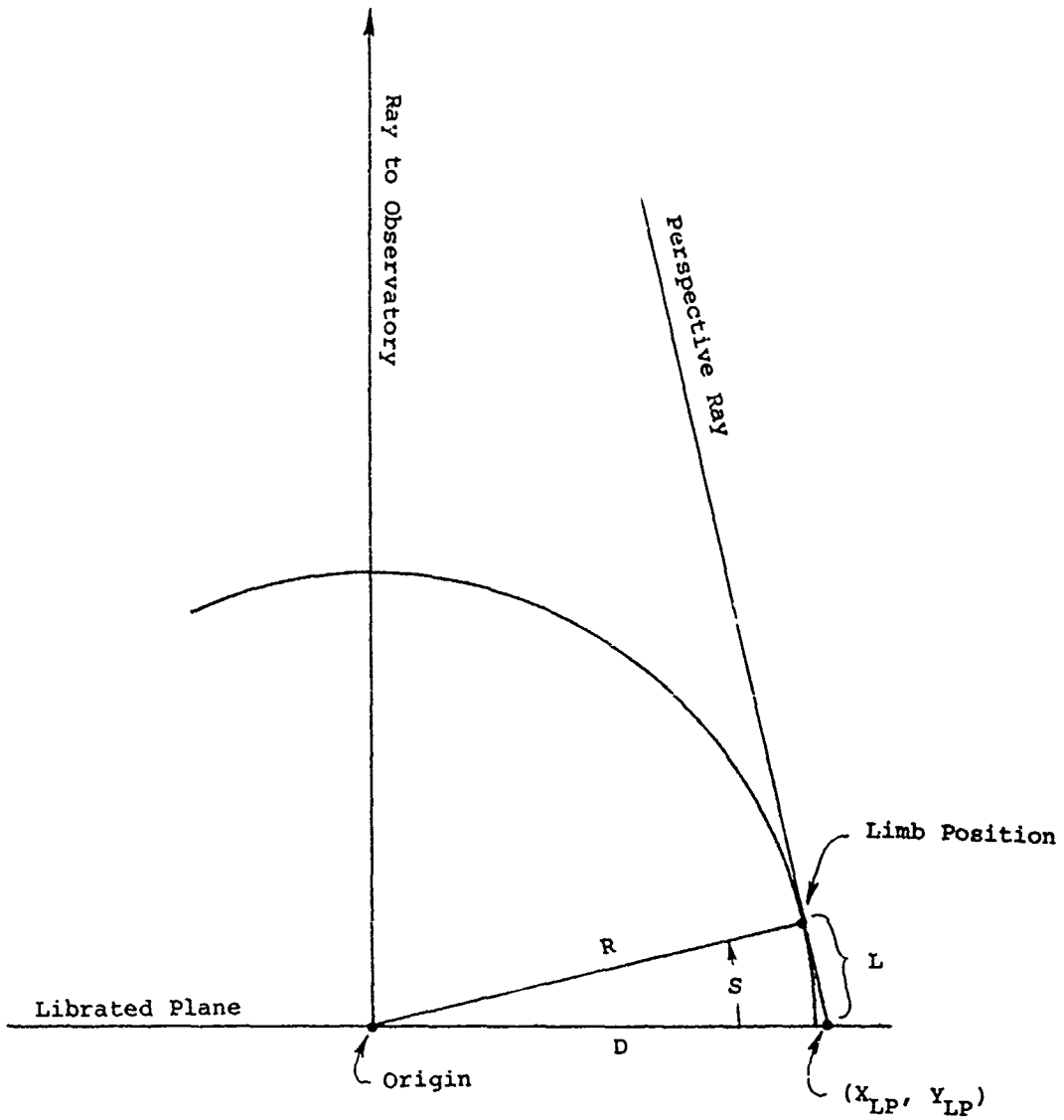

Figure 7. Limb Positions

$$Y_{sp} = L \cos \gamma + Y_s$$

$$Z_{sp} = L \cos \alpha + Z_s$$

$$\text{Radius Vector}(R) = (X_{sp} + Y_{sp} + Z_{sp})^{1/2}$$

$$\text{Latitude} = \sin^{-1} \left(\frac{Y_{sp}}{R} \right)$$

$$\text{Longitude} = \tan^{-1} \left(\frac{X_{sp}}{Z_{sp}} \right) \qquad (31)$$

Equations (30) and (31) were applied to each limb measure on every plate. The results are tabulated in Appendix III as latitude, longitude and radius vector.

VI. CONCLUSION

Although it is not the optimum solution, the present work is the most comprehensive adjustment to date. It would be more useful to have the origin coincide with the moon's center of mass rather than the center of figure. Since this location cannot be directly identified with earthbased photography, some additional source of information is required for a proper determination. At present, the best available data for this purpose is the derived coordinates of laser retro-reflectors and radio transmitters at the various landing sites.

The average unit sigma for all control points was slightly less than 500 meters. In general, individual errors vary according to their location on the moon's surface. The same measuring error in the photographic plane causes a larger surface displacement in limb areas than in the central part of the lunar disc. As a result, relative errors in feature coordinates generally grow larger from the central regions toward the limb. This is somewhat amended by the character of the feature itself. Small well defined features near the limb can have errors more compatible with those in the central regions.

In this work, relative errors in feature coordinates range from about 200 meters in the central regions to a kilometer in the limb areas. There are exceptions to this trend which reflect the varying image quality of individual features. Although this is a normal effect in all earthbased work, it is not an optimum condition for a control system. This situation could be somewhat corrected by additional determinations of feature coordinates in the limb areas using photography selected for that purpose. That is, additional lunar plates in which the limb areas are well defined. This would not equalize the errors with the central regions but would reduce the disparity.

To develop this optimum situation will require a large number of high quality lunar plates containing a wide variety of libration angles. Many such

plates already exist in the photographic collection of the U.S. Naval Observatory. They were not used in this fundamental solution since their phase angle would not permit the measurement of all 1156 control features. However, they would be quite useful in upgrading limb feature coordinates and identifying small features in the close vicinity of the lunar landing sites. In conjunction with the additional photography presently being acquired by the U.S. Naval Observatory, the optimum earthbased solution would be a feasible undertaking.

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APPENDIX I

IDENTIFICATION OF LUNAR CONTROL FEATURES

This appendix identifies the control features and lists the corresponding number in other control catalogs as follows:

Column 1 - Control feature number

Column 2 - ACIC control including unpublished mapping control

Column 3 - Kiev publication of Goloseyevo 1 and 2 catalogs

Column 4 - Manchester University (Mills-2)

Column 5 - Schrutka-1 catalog

Column 6 - Apollo mapping camera missions

Column 7 - I.A.U. list

Column 8 - System of lunar craters (Arthur, et. al.), University of Arizona

Column 9 - Name or description

SELENOCENTRIC LUNAR CONTROL
Fundamental Points

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
1	1	235		127		29L	27078	Reiner A
2	130	241			4N0R1	28L	27336	Herodotus A
3	129				Z66R2	69	25304	Brayley D
4	128		473			22L	23249	Draper C
5	146		497			65	24140	Hortensius C
6	3	205		82		70	25010	Lansberg A
7	149	163			8N5R4		22003A	Gambart G
8	5	259		104	8N0R5	31L	30095	Mosting A
9	8	1		29	8M5R5	1	10002	Bruce
10	180	23	327			10	11212	Manilius D
11	10	14		11	B59R1		10470	Aratus
12	115				CJ4R1	47	21342	Eratosthenes B
13	117				3N0R4		22511	Timocharis F
14	126	184			3N5R2		23567	Carlini A
15	13	198		91		67	24671	Mairan E
16	14	200		132		23L	24753	Sharp A
17	121		514				23708	Maupertuis L
18	106		398				20768	Plato G
19	103		366		3M0R3		20603	Piton B
20	15	31		47		3L	11718	Egede A
21	37		205				13718	Baily K
22	40						13626	Plana D
23	16	98		37			15645A	Cepheus A
24	44	77		121	3K0R2	29	14512	Posidonius A
25	101	42			3L0R2	14	12510	Linne' B
26	17	61		19	360R2	22	13421	Bessel A
27	19	38		135	4H4R2	16	12122	Silberschlag A
28	185				8M0R6		41037	Horrocks M
29	93		303		9M8R3		42202	Abulfeda Q

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
30	22	404		13	9N3R1		40370	Argelander D
31	192		394		9P0R4		31300	Alpetragius H
32	171		449		9Q0R7	92	32283	Opelt K
33	153	315	489		R64R1	100	34126	Euclides D
34	144						36122	Wichmann B
35	141					109	37005	Flamsteed D
36	139	385		40		49L	38049	Damoiseau E
37	157		626				37269	Zupus A
38	158		623			110	37405	de Gasparis B
39	159						35491	Doppelmayer J
40	161					101	34535	Ramsden A
41	628	371					36645	Lehmann H
42	162	330					34713	Schiller A
43	164		493			89	32769	Longomontanus R
44	194	279				85	31472	Lippershey T
45	87						41504	Aliacensis D
46	84						41736	Cuvier C
47	27	440		106		55L	42697	Nicolai A
48	28	467		75		58L	44761	Janssen K
49	78	477				60L	45651	Rheita P
50	68				4E0R1		47249	Cook B
51	30	488		115	927R3	65L	47023	Messier A
52	32		37		343R1	39	18252A	Picard X
53	34	109			AM0R2	13L	16485	Tralles B
54	48	92			B46R1	37	15284	Maraldi B
55	56				932R2	35	15068	Maskelyne H
56	54	455		102	8L0R1		44001	Moltke
57	66							W.S. in Daguerre
58	72						44324	Beaumont G
59	21	433		131			42359	Sacrobosco C

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
60	74		237				43468	Rothmann K
61	823		358		8M5R4		10022	Blagg
62		4		128		2L	10093	Rhaeticus A
63	7	20		129			11012	Rhaeticus B
64	833				8M0R3		11064	Godin A
65	182		334		8M0R8		11006	Triesnecker D
66	183				8M5R3		10045	Triesnecker J
67	822	?		38			10016	Chladni
68	181		340		4J0R2	7	10183	Hyginus B
69	828				4J0R3		11143	Hyginus C
70	179						10107	Ukert Y
71	790		345		4J0R1	6	10199	Hyginus D
72		6	352					W.S. Mare Vaporum
73					BP2R1		10352	Conon W
74			320		941R1		11340	Manilius H
75	112		332		C32R1	9	11303	Sulpicius Gallus G
76	111				Y18R2	13	11347	Sulpicius Gallus A
77	770				Y18R1		11450	Aratus C
78	769				Y18R2	11	11431	Aratus D
79		27			B59R2	2	11402	Hadley A
80							10338	N. of Conon
81								W. of Hadley C (Pk)
82	110	11			3M0R5			S. of Autolycus α
83			326					Pt. Fresnel ϕ
84					3L5R3			N. of Pt. Fresnel ϕ
85					3L5R2		10581	Autolycus K
86								N. of Montes Caucasus V
87	740				3M0R4	5	10565	Aristillus A
88		16					10664	Cassini A

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
89	102		350			3	10646	Cassini M
90		30		34			11606	Cassini C
91			344				10659	Cassini L
92	716						10765	Trouvelot
93	702					8	10797	Egede B
94	699		335				10853	Protagoras B
95	687		338				10847	Archytas W
96							10859	W. Bond G
97	104	19		25		1L	10950	W. Bond B
98			318				10878A	S. of Archytas U
99	97		293		8M0R1		12040	Theon Senior B
100	847				8L0R2		13021	Schmidt
101								E. of Godin E
102		34		35	4H4R5	5L	12066	Cayley
103	842						12098	Ariadaeus D
104		37		134	4H4R1		12110	Silberschlag
105	839		289		4H4R6		12182	Julius Caesar C
106	840				8L0R3		13122	Sosigenes C
107				137			12195	Sosigenes
108	98		299		4H4R3		12116	Boscovich A
109	799		262		937R1		13210	Ross C
110		39						SW of Menelaus D
111					4H4R4			Julius Caesar PA
112	18	55		139	C27R1	21	13218	Tacquet
113	796					15	12229	Menelaus A
114			313					W.S. NW of manilius Z
115	99	40			C29R1	18	12353	Bessel E
116	1186		290		C29R2			Bessel G
117		41		18		6L	12387	Bessel

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
118	100		281		363R2	19	12454	Linne' E
119								Artaus CC
120	749	60			360R1		13405	Bessel D
121	748		278		3L0R4		12458	Linne' D
122	747		291		3L0R3		12418	Linne' A
123		28		85	363R1		11486	Linne'
124			311					Linne' B
125			255		3L0R5		12592	Posidonius W
126	746						12503	Linne' F
127	745				3L0R1		11595	Linne' H
128	744				3L5R6		11588	Linne' G
129	742						11548	Calippus B
130							11662	Calippus E
131		43					11694	Alexander B
132	725		283					S. of Eudoxus
133	726						11668	Eudoxus D
134	39						12721	Eudoxus G
135							11724	Egede F
136	703		298				11746	Egede C
137	704		307				11810	N. of Egede A
138	705	33					11863	Sheepshanks C
139			260				11866	Sheepshanks A
140			256				11858	C. Mayer F
141			259					E. of Meton W
142	684							Inside Meton C
143	52				8L0R6	25	13056	Arago B
144			241		8L0R4			Arago CA
145	53		229		8K5R2		14044	Maskelyne G
146	856	71			8K5R1		14083	Maskelyne B
147			226					Maskelyne MA

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
148			209		932R1		15009	Maskelyne N
149	1189		246		8L0R5	27	13171	Arago D
150	848		242		936R1		13184	Arago E
151	849				934R1	31	14136	Jansen G
152		72		74			14148	Jansen B
153			211			33	14095	Maskelyne K
154	51						14118	Ross G
155	811				CF9R4		14189	Jansen K
156	49	74			C24R1		14254	Jansen E
157							13292	Plinius A
158							13167	Ross H
159	50					24	13243	Tacquet C
160		56		140			13234	Tacquet A
161		57		117				Plinus β
162					CF9R1	32	14257	Jansen D
163	804						14267	Jansen C
164	805						14361	Vitruvius E
165	777	75			357R3		14366	Littrow B
166	772				357R1	28	14318	LeMonnier C
167			244					SE of Deseilligny
168	771	58			B53R1	23	13326	Deseilligny
169			214		357R2			LeMonnier LA
170	773				358R1		13483	LeMonnier B
171	750		249		3K5R1		13419	Posidonius N
172		62			3K5R3			Posidonius γ
173	43				3K0R1		13584	Posidonius F
174	751	63			3K5R2	7L	13544	Luther
175	41						13518	Luther H
176								W. of Plana G
177							13614	Plana F

No.	ACIC No.	Kiev No.	Mar. No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
178		45					12697	Burg B
179		46		50		17	12731	Eudoxus A
180	752	67					13640	Daniell D
181			210					S. of Mason B
182	738						13666	Mason B
183								NE of Burg
184	707						12820	Galle A
185			227				12779	Aristoteles N
186	708					20	12870	Aristoteles M
187	706	48					12824	Galle C
188	694						12815	Kane G
189							12910	Moigno A
190			212				11991A	Moingo C
191							11972	Neison A
192							45090	Maskelyne T
193					931R1		16006	SE of Maskelyne F
194			191					NE of Maskelyne D
195			192		CF9R3		15141	Sinas K
196	1195						15163	Cauchy M
197	852	90			CF9R2	IIL	15115	Sinas
198	57		184		C21R1		15147A	Sinas J
199			168				15196A	E. of Cauchy F
200								S. of Cauchy C
201							14285	Jansen L
202	814						15254	Vitruvius G
203			160		738R1		16204	Lyell B
204							16216	Lyell C
205					S63R4	36	15354	Maraldi A
206	781				S63R2		15368	Romer J
207	784	94			355R1	34	15329	Romer L

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
208	45						14490	Littrow D
209	785				S63R1		15412	Romer M
210							15433	Romer Y
211		95					15436	Romer C
212	775	76			3K0R4		14446	LeMonnier K
213	774				3K0R3		14459	Chacornac A
214	761		172				15512	G. Bond A
215	758	81					14588	Hall J
216	42						14558	Hall K
217	754	78					14516	Posidonius M
218	755						14529	Daniell X
219		97		95			15610	Maury
220	757						14681	Maury D
221							14632	SE of Grove
222	7[illegible]	82					14608	Mason C
223	739	83				30	14627	Hercules C
224							14647	Williams N
225	735						14629	Hercules J
226	36	85					14750	Hercules D
227	736	84		66		9L	14732	Hercules G
228	733						14704	Hercules E
229	732						13772	Burg A
230			175			26	13767	Baily B
231			151				13835	Thales W
232	710		179				12895	Gartner D
233	38						12857	Democritus A
234		50	199				12902	Arnold G
235							12839	Democritus D
236							12912	Arnold F
237								W. of Arnold M

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
238	59						17060	Taruntius H
239	1200	113		142	C14R1		17053	Taruntius G
240	1201						17025	Taruntius B
241								SE of Secchi
242	58		144		C18R2	38	16066	Secchi B
243	858	101			C18R1		16049	Taruntius E
244	1196						16173	Taruntius MB
245							17110	Taruntius C
246	31	114		141	638R1	14L	17152	Taruntius A
247		116			B42R1		17232	Glaisher
248	47						16294	Proclus F
249			130				16280	SE of Proclus C
250		104		123	B44R1		16253	Proclus A
251								SE of Proclus E
252							16381	Macrobius D
253	46	107		89	352R1		16315	Macrobius B
254	1219				S63R5		16410	Macrobius Y
255	1218				S61R1		16398	Macrobius F
256	1220	108		147	AM0R3		16446	Tralles A
257					S63R6		16412	Macrobius V
258							16541	Geminus G
259	35					12L	16504	Berzelius F
260							16506	Geminus W
261							15547	Maury B
262	1181						16650	Franklin H
263	1158		152				15603	Maury J
264								E. of Williams
265	1159						15617	Oersted U
266			102				15666	NE of Cepheus A
267	1160		104				15721	Atlas AA

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
268							14790	Atlas X
269							14773	Inside Atlas
270			133				14755	Inside Atlas E
271	1144		146				14718	Hercules H
272								NE of Baily B
273			123				14739A	NE of Hercules A
274	1138	51					12970	Schwabe G
275							13838	Thales G
276	60		71		C13R1		18013	Taruntius O
277			89				17081	Taruntius K
278	1202	123			635R1		18035	Apollonius C
279	1204						18019	Apollonius K
280							17184	NW of Taruntius X
281			48					S of Picard Y
282			64		V48R2			S of Picard
283			85					N of Lick D
284	1215				V48R1			Picard Z
285							17247	Yerkes E
286	1216		77		347R1		17353	Pierce B
287								W. of Tisserand B
288	33		54		S60R1		17378A	Cleomedes FA
289							17470	Cleomedes GA
290	1222	120			S61R2		17451	Cleomedes P
291							17421	Cleomedes N
292	1221	119			AL5R1		17435	Cleomedes B
293			57		AL5R2		17445	Cleomedes J
294			50				17449	Cleomedes S
295	1176						17433	Geminus C
296			83				16621	Berzelius W
297	1171	111					16625	Hooke D

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
298	1169						15678	Shuckburgh C
299			55				16609	Shuckburgh E
300	1163						15772	Chevallier F
301		86					14797	Endymion K
302				48			14853	Endymion G
303							14776	W. of Atlas D
304	713						14815	de la Rue J
305		70		143			13868	Thales
306			12		R29R2		49020A	Inside Maclaurin O
307							18071	Webb E
308			21		R29R1			NW of Dubiago R
309	1235		9				19027	Dubiago Y
310					533R1		18171	Firmicus F
311					X11R1		19103	E of Firmicus
312							19119	Condorcet E
313			43				18163	Firmicus H
314			41					Picard Y
315								NE of Picard Z
316			23		S56R1			SW of Eimmart KA
317			14		S56R2			Eimmart KA
318					S56R3		18171	Eimmart F
319	1223						18413	Eimmart G
320							18359	Eimmart D
321	1224	126		63			18419	Hahn A
322								Cleomedes DG
323	1333		10				17574	Berosus A
324	1174	122					17548	Bernouilli D
325							16680	Messala B
326	1172						16685	Messala C
327	1165	112					16668	Zeno P

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
328	1166						16721A	Mercurius L
329	1162	99					15785	Mercurius H
330	1141	100					15840	Endymion E
331							19054	Dubiago S
332							19151	Dubiago X
333	1233				338R1		19145	Condorcet M
334	1230	128		64			19233	Hansen A
335								NE of Alhazen
336	1226						13369	Plutarch C
337							18453	Plutarch L
338								NW of Bruce
339	450				8N0R2		20044	Pallas D
340								E of Schroter
341					8N0R3		21023	Schroter L
342			412					S of Schroter S
343	177		384			43	20161	Bode G
344		130		23		16L	20115	Bode A
345	9	132		24			20155	Bode B
346	178	151					21104	Schroter J
347							21211	Bode H
348	114	137					20284	Marco Polo C
349	383						20235	Marco Polo A
350	113	135			BP7R1	40	20239	Marco Polo B
351	381	136					20277	Marco Polo F
352							21227	Wolff A
353							21252	Eratosthenes K
354					947R1		20392	Wallace A
355							20333	Huygens A
356			378		C36R1		20442	Archimedes L
357	350	153			C38R2		21420	Archimedes F

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
358	349	155			C38R1		21445A	Feuillee
359			409		3M5R4		21511	Archimedes X
360	11	141		12	C38R3	17L	20497	Archimedes A
361					3M5R5		20570	Archimedes T
362							20437	Archimedes Q
363			368		3M0R6			E of Archimedes K
364	326	142					20522	Archimedes C
365			379		3M0R1	41	20533	Archmides D
366		140			3M5R6		20554	Archmides V
367	109				3M5R3	45	21524	Spitzbergensis C
368	324				3M0R2		20527	Aristillus B
369	108		402		3M5R2		20599	Kirch E
370			415				21633	Kirch M
371					3M5R1		20673	Kirch
372	277		382			42	20644	Piazzi Smyth B
373								S of Prof. Deville
374	276		407				20790A	Pico K
375				116				Pic .
376	275		401			44	20773	Pico C
377							20732	Plato KA
378			406				20786	Plato U
379								Inside Plato
380							30708	Alpes A
381	105	146					20822	Plato H
382	240		413				20883	Plato VA
383								SW of Timaeus
384		149					20902	Epigenes A
385							20809	N of Timaeus
386			410				20952	Epigenes F
387							20936	Goldschmidt D

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
388	4	176		55	8P0R5	20L	23021	Gambart A
389	148				8N5R1		22065	Gambart L
390		164				52	22005	Gambart C
391	147		453			58	23112	Copernicus H
392	439		423			51	22102	Schroter M
393								SW of Stadius K
394	377					54	22220	Stadius B
395								SW of Copernicus K
396			461				23224	Gay Lussac F
397							21289	Eratosthenes D
398							22365	Pytheas H
399	346						22461	Timocharis E
400	116	167			C40R1	56	22441	Timocharis A
401			434		C40R3		22421	Timocharis C
402	348				C40R2	50	21486	Timocharis B
403		168		81				Lambert γ
404			459		C43R4			NW of Lambert γ
405	315	169			3N0R3	55	22534	Carlini D
406	317				3N0R5		21680	Le Verrier C
407	118		451		3N0R2		22631	Le Verrier A
408	107					46	21648	Pico D
409	270					53	22617	Le Verrier E
410	119						22731	Laplace F
411						18L	21782	Pico B
412	269		435				21762	Pico BA
413	272						21722	Pico G
414	236					49	21776	Plato E
415	235						21768	Plato P
416	239		422				21811	Plato T
417	233	161					21863	Plato W

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
418		160	458					N of Fontenelle G
419	208						21829	Fontennelle P
420							24062	Lansberg X
421							24023	Reinhold NA
422						62	23065	Reinhold F
423	420						23067	Reinhold A
424							23173	Copernicus B
425	365						24272	Tobias Mayer F
426						64	24241	Tobias Mayer D
427							24230	Tobias Mayer R
428								S of Gay Lussac H
429		192		96			24256	Tobias Mayer A
430								N of Gay Lussac H
431							24239	Tobias Mayer G
432	340		511		Z64R1		24346	Euler L
433			482		Z62R2		23377	Pytheas W
434	344		475		Z62R3	61	23344	Pytheas A
435	343				C43R2		23424	Lambert A
436	341		506		670R1		24432	Euler H
437	127	182	481		C43R1	60	23447	La Hire A
438					C43R3		23500	Carlini B
439			483		3N5R4		23541	Carlini K
440	305				3N5R3		23553A	Carlini G
441	12	183		33		21L	23435	Carlini
442	309		477		3N5R1		23517	Carlini C
443	311	170			3N0R1	57	22681	Helicon B
444	262		486				23614	Helicon E
445	170	185				59	23629	Laplace A
446			509					W of Laplace A
447	265	172					22793	Laplace D

No.	ACIC No.	Kiev No.	Mian No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
448								W of Laplace F
449		171		94			22767	Maupertuis A
450	229						22728	Laplace L
451	228					19L	22749A	La Condamine Q
452		175		39			22891	La Condamine A
453			492				22841	La Condamine O
454	230						22801	La Condamine R
455		173					22824	La Condamine S
456	225						22855	La Condamine T
457	204		503				22826	Fontenelle X
458			479				21888	Fontenelle B
459			513				22819	Fontenelle M
460			507				22900	Fontenelle F
461	203						22901	Anaximenes E
462	406	206					25091	Encke C
463			546				25077	Encke M
464	145	204						Hortensius A
465	401	209		77		26L	25182	Kepler A
466	399						26124	Kepler F
467	409	208					25126	Milichius A
468	2	190		101			24197	Milichius
469								E of Kepler P
470			541				25255	Bessarion V
471								W of Tobias Mayer B
472	359				4M15R1		26219	Bessarion A
473			566		4M15R2		25396	Brayley E
474		212		28		25L	25365	Brayley
475	339		537		Z66R1		25325A	Brayley F
476	338				672R1	68	25401	Euler E
477							25442	Brayley S

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
478	336						25426	Diophantus A
479	337				959R1		25405	Diophantus C
480		195		45		24L	24496	Diophantus
481	125				C47R1	66	24468	Diophantus B
482	303					63	24532	Heis D
483	298		540				24566	C Herschel E
484	295						25508	Gruithuisen B
485	293		568				24693	Mairan H
486	300						24620	C Herschel C
487	254	197					24645	W of Heraclides A
488							24614	SE of Prom Heraclides
489	266						23698	Heraclides E
490								SW of Laplace A
491		203		133			24783	Sharp B
492			558				24723	Sharp J
493	261						23772	Bianchini G
494	222						23739	Bouguer A
495	223						23800	La Condamine D
496	224	174					22874	La Condamine F
497							23823	Horrebow C
498			533				22876	J Herschel N
499							23855	Horrebow B
500	201						22898	J Herschel C
501	142	220				72	26040	Encke E
502			576				26073	Maestlin G
503			590				27010	Stess FB
504	137						27063	Reiner E
505	388	234					27037	Stess
506	136						26088	Maestlin H
507	396	221					26048	Maestlin

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
508			577					SW of Kepler D
509			609				27156	Marius W
510			589				27108	Marius DA
511	135	223					26157	Kepler C
512		237		93		27L	27201	Marius A
513							26225	Bessarion G
514	134					73	26257	Bessarion C
515	355	238			4N0R3		27208	Marius B
516			598				26382	Aristarchus S
517	334	226			Z69R1		26323	Bessarion D
518					Z69R2		26420	Aristarchus D
519							26463	Aristarchus A
520	333	227			C53R1	74	26456	Aristarchus C
521					C52R1		26426	Krieger C
522	288	213			C50R2	71	25479	Angstrom
523			573		C50R1		25561	Angstrom A
524	289		586				25592	Angstrom B
525	124	230			C53R2		26520	Wollaston
526			611				26468	Aristarchus P
527	287		604				26524	Wollaston D
528								SE of Gruithuisen K
529	292		591				25653	Mairan N
530	249		572				24695	Mairan K
531	246						25656	Mairan T
532							25629	Louville B
533	250	202					24770	Sharp D
534							24756	Sharp W
535	218						24802	Harpalus C
536	219	188					23874	South B
537			584				23883	Harpalus B

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
538			605					NW of Robinson
539			620				27080	Hermann E
540							28022	Hermann F
541			650				28049	Reiner N
542	387						28103	Reiner L
543							27166	Marius K
544							28106	Marius X
545	133	239					27270	Marius E
546			641					Galilaei M
547	353						27297	Marius L
548	131	240			4N8R4		27289	Marius M
549	354		618		4N0R2		27340	Marius P
550			644					W of Marius N
551	331	242					27358	Herodotus B
552			652		4N8R5			NE of Shiaparelli
553							27413	Herodotus L
554	330	243			C55R1			Herodotus X
555			659				27464	Schiaparelli B
556	329		660		E70R1		27466	Schiaparelli D
557					E70R3		27458	Lichtenberg A
558			640		E68R1		27510	Lichtenberg G
559			629		C53R3		26591	Wollaston V
560	286	231					26562	Wollaston C
561	285	232	645				26652	Rumker E
562			617				25685	Mairan G
563							26608	Rumker L
564			634				25762	Louville K
565	243	218					25732	Louville D
566	122	201					24769	Harpalus E
567			628				24870	Harpalus H

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
568							24814A	South A
569							24835	Babbage C
570	386						28075	Hevelius D
571	385						29024	Hevelius A
572	384		677				28194	Cavalerius F
573							29130	Cavalerius C
574			670					Galilaei D
575	132	251				30L	28270	Galilaei A
576		250	665				28254	Galilaei E
577			684				28291	Galilaei G
578			664		4N8R3		28247	Galilaei T
579					4N8R2		28307	Seleucus A
580			668		4N8R1	75	28328	Schiaparelli A
581							28432	Briggs C
582	328				E70R2		27493	Schiaparelli C
583								Lichtenberg ε
584							27564	Lichtenberg F
585		244					27534	Lichtenberg B
586	283						27517	Naumann
587	284	233					26690	Naumann B
588			674				26685	Harding H
589							26667	Rumker T
590	258		687				26677	Harding D
591							25766	Markov F
592							25747	Markov E
593		253					29061	Riccioli H
594							29055A	Hedin K
595		256					29151	Obers B
596							29159	Cardanus C
597							29222A	Cardanus E

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
598							29226	Krafft D
599							29217	Krafft C
600								Inside Eddington
601							28389	Struve C
602							28462	Struve D
603	255						26716	Repsold R
604							26741	Dechen
605	197				8M5R6		30000	Oppolzer A
606	187		369		8M5R7		30015	Reaumur X
607	519	257		51			30043	Flammarion A
608	188	258		68	8N0R1	77	30058	Herschel C
609	176	270		105	8N0R4		31043	Mosting C
610	175	269		80			31019	Lalande C
611	504	272		79			31161	Lalande A
612			405			83	31024	Mosting B
613	190				R57R2	82	31126	Palisa P
614	189				R56R1		30186	Ptolemaeus JA
615	511				R56R2		30165	Ptolemaeus L
616	6	260		124	R54R1		30114	Ptolemaeus A
617	553				R55R1		30251	Alphonsus G
618					R57R1			SE of Davy A
619		274		42			31231	Davy A
620			414		R58R3		31167	Davy K
621	191	273				33L	31216	Alpetragius B
622	555				9P0R7	76	30206	Alphonsus H
623	556				9P0R5		30320	Arzachel A
624							30371	Arzachel Y
625							31227	Lassell B
626	550				9P0R3		31333	Thebit D
627		277		21			31338	Birt

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
628	586					78	30379	Thebit E
629							30328	Purbach D
630							30411	Purbach T
631	589						30424	Purbach A
632	195		396			80	30497	Regiomontanus E
633							31438	Pitatus L
634						32L	30683	Orontius D
635						81	30798	Maginus Y
636		267					30900	Cysatus A
637		280		149			32022	Turner
638	502				8N5R2		32015	Turner L
639	150				8N5R3	88	32042	Turner F
640	497				8P0R2		32083	Fra Mauro G
641			457		8P0R4		33014	Fra Mauro J
642	496				8P0R3		33008	Fra Mauro D
643			439		8P0R1		32050	Gambart N
644								E. of Bonpland F
645					8N5R8		32111	Parry C
646	493				R59R2		32153	Parry F
647		283		109			32176	Parry A
648	172				R62R2		33107	Bonpland D
649					R61R1	94	32199	Guericke A
650	173				R59R1		32240	Guericke D
651	174	282			R58R1		32107	Guericke E
652	23	276		61	R58R2	36L	32290	Guericke C
653			421		9P0R1		31285	Lassell H
654			438		9Q0R6		32245	Guericke P
655		286		60			32255	Guericke B
656	168	288			9Q0R3		32299	Opelt E
657	167		448		9Q0R4	91	32372	Gould A

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
658	549						32209	Lassell F
659	193	278			9P0R2	84	31361	Lassell E
660					9Q0R5		32314	Nicollet B
661	584						31367	Birt B
662	26	289		107			32307	Nicollet
663	581		454				32397	Wolf A
664							32450	Wolf E
665	166	292	456			93	32482	Kies D
666		291				38L	32465	Hesiodus B
667	583		432				32404	Pitatus J
668			416				31454	Lippershey R
669							31477	Pitatus XA
670		293		69			32550	Hesiodus A
671							32570	Weiss A
672							32533	Wurzelbauer N'
673	617						31593	W. of Gauricus N
674						34L	31567	Gauricus D
675							32517	Wurzelbauer C
676	611					90	32579	Cichus K
677								N. of Heinsius A
678		295		65			32633	Heinsius A
679	614						31691	Heinsius G
680	615		420				31643	Sasserides B
681							31741	Street P
682	648						32629	Wilhelm E
683	650		443			87	31790A	Tycho H
684	667			90			31709	Maginus H
685	672		442				31850	Clavius R
686	674						31801	Clavius MC
687							31844	Clavius Y

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
688						35L	31864	Clavius J
689							30888	Ruthurford A
690							30847	S. of Deluc E
691							33050	NW of Gambart R
692							33094	Lansberg P
693	488		494				34043	Lansberg N
694	486	314				102	34074	Lansberg B
695	489						34017	Euclides K
696	151	298					33067	Fra Mauro B
697		299				39L	33059	Fra Mauro A
698	152				R62R4	97	33176	Bonpland E
699			472		R62R3		33168	Bonpland P
700	487	317		49			34182	Euclides
701		316			R65R2		34167	Euclides M
702	154		488		R64R2	99	34211	Darney E
703		303		41			33285	Darney
704		318				41L	34224	Darney C
705	170	302				96	33254	Darney J
706	543				9Q0R1		33288	Lubiniezky D
707	169				9Q0R2		33351	Lubiniezky F
708							34324	Agatharchides G
709	578	321		6			34339	Agatharchides A
710							34424	Campanus K
711							33493	Kies C
712			485				33377	Bullialdus E
713			474					N. of Bullialdus A
714	580						33438	Kies E
715							33478A	Mercator D
716							34428	Campanus B
717	579					98	34511	Marth

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
718								Mercator H
719	607					95	33524	Cichus H
720	165	305					33505	Cichus C
721							33650	Capuanus F
722							33653	Capuanus H
723							33622	Haidinger A
724	610						32663	Heinsius J
725							32657A	Wilhelm W A
726							32687	Wilhelm F
727							33710	Lagalla N
728	639	308					33731	Mee C
729	641						33703	Lagalla T
730							33708	Bayer P
731							32765	Longomontanus L
732							32812	Clavius F
733							32853	Scheiner H
734	668	296				37L	32836	Scheiner A
735			480				31897	Blanchanus K
736	163						32818	Scheiner G
737	683						31955A	Casatus C
738		334		83			35003	Lansberg E
739	483						35005	Lansberg D
740								N. of Lansberg FC
741			552					Wichmann CA
742			554				36008	Wichmann C
743	473	353			R68R2	45L	36113	Wichmann
744			553		R68R3		35192	Wichmann A
745	196		536				35151	Euclides F
746					R68R4		35158	N. of Herigonius ω
747	539	319			R65R1		34282	Euclides C

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
748			529				35216	Herigonius G
749		337		67		43L	35243	Herigonius
750						105	35263	Herigonius E
751	534				R68R1		36211	Letronne A
752		359					36300	Gassendi N
753							35351	Gassendi TA
754							34394	Agatharchides F
755	25	340		57			35356	Gassendi J
756	567	341				106	35385	Gassendi Y
757							35379	Puiseux F
758		565					35474	Puiseux A
759	160	342					35433	Puiseux D
760	573					103	34490	Hippalus A
761							34452	Hippalus B
762		324					34450	Dunthorne
763	571					104	35408	Vitello E
764							35531A	Lee H
765							34592	Vitello L
766	602						34589	Hainzel X
767		323					34527	Ramsden G
768								W. of Hainzel R
769	605	327					34620	Hainzel K
770	604					40L	33668	Epimenides A
771							34646	Mee X
772		328				42L		Mee F
773							34629	Mee Y
774	636		530				33781	Mee D
775	635	310					33773	Bayer L
776								SE of Bayer Z
777								SE of Schiller G

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
778							33830	Bayer X
779							32894A	Rost N
780		311					33815	Weigel A
781							32887	Scheiner L
782							32990	Bettinus H
783							32931A	Scheiner L
784							32921	Scheiner M
785							32914	Wilson F
786		349					36044	Flamsteed FB
787	143	351					36058	Flamsteed F
788	467		583				36085	Flamsteed K
789	403						37042	Flamsteed Z
790	140	377					37151	Flamsteed CA
791			592					S of Flamsteed C
792	465	355			R70R1	46L	36173	Flamsteed A
793		354			R69R1		36149	Letronne B
794	464	376					37116	Letronne F
795	529						37232	Billy K
796						47L	37225	Billy D
797	155						36294	Billy A
798	24	358		56			36278	Gassendi G
799	531					108	36285	Gassendi F
800		363		98			36368	Mersenius S
801		362		97			36373	Mersenius C
802	565		575			107	36324	Gassendi L
803	564	361					36368	Mersenius E
804			570				35490A	Doppelmayer L
805	563	366					36451	Liebig F
806			602				36465	Liebig BB
807	562						36458	Palmieri E

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
808							35498A	Doppelmayer R
809		369		108			36533	Palmieri A
810	598						35595	Doppelmayer W
811	601						35620	Clausius G
812							*35559A*	*E of Clausius A*
813	596					44L	35691	Drebbel D
814			599					S of Drebbel B
815	632						34695	Drebbel M
816			600				35629	Noggerath M
817	631						34784	Noggerath F
818			580				34763	Noggerath B
819			574				34734	Schiller M
820			608					N of Phocylides KB
821							34831A	Schiller E
822							34800	Schiller P
823							33836	Weigel C
824							32980	Kircher B
825							33951	Bailly G
826	460		64				38030	Hermann B
827			653				38045	Damoiseau GB
828							38004	Hermann D
829			622				37098	Flamsteed HA
830			637				38028	Damoiseau GA
831							38144	Damoiseau BA
832			648				38128	Sirsalis K
833	526		646				38212	Fontana K
834	528						37262	Hansteen A
835			656				38219	Fontana W
836	558						37394	de Vico K
837	533	380					37332	Zupus RA

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
838			627				37347	Cavendish L
839							37461	Cavendish B
840			657				37473	Paul Henry P
841							37448	Vieta C
842							37500b	Fourier K
843							36562	W of Fourier D
844	597	368					36528	Lehmann C
845			625				36565	W of Fourier R
846	593						37524	N of Lacroix R
847	595	373					36662	Lacroix H
848	629						35694	Drebbel L
849			631					S of Schickard N
850			624					SE of Schickard R
851							35735	Nasmyth D
852							35716	Nasmyth F
853							34797	Phocylides X
854							34860A	Phocylides D
855	138	387		86			38081	Lohrmann A
856			691				39032	Lohrmann BA
857	459	386					38074	Grimaldi C
858			666				38087	Damoiseau J
859							38192	Grimaldi G
860			688				39118	N of Rocca D
861	156	397					39202A	Rocca AC
862	525	389		136			38243	Sirsalis F
863	524						38249	Cruger C
864			689				38380	Cruger G
865	557					L48	38325	de Vico C
866							38316	de Vico E
867		391		31			38411	Byrgius A

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
868			685				38434	Byrgius V
869	560	381					37499	Lagrange H
870							38418	Lagrange X
871							37459	Vieta L
872							37583	Lagrange A
873			680				37620	Piazzi B
874	594	383					37518	Piazzi F
875							36694	Piazzi G
876	620	372					36648	Schickard H
877							35796	Inghirami T
878							35793	Wargentin C
879							36750	Inghirami W
880							39042	Riccioli G
881			696				39048	Grimaldi H
882							39133	Grimaldi T
883							39220A	W of Rocca E
884							39225	Rocca J
885			697				39209	Cruger B
886							38385	Darwin C
887	862						40040	Reaumur D
888	186	399			8M15R2	113	40053	Seeliger
889	184				8M10R7	117	41023	Pickering B
890		411			8M10R4		41061	Lade M
891	880				G69R2		41151	Hipparchus L
892		413		70	G69R3	L53	41142	Hipparchus C
893		410		71			41028	Hipparchus G
894					8M15R1		40088	Hipparchus N
895							40047	Hipparchus F
896							40085	Horrocks U
897					R54R3		40132	Hipparchus K

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
898			361		R54R2		40116	Ptolemaeus Y
899	931				R54R4	114	40167A	Albategnius C
900	94				G69R1	120	41158	Ritchey C
901			330		9N3R3			NE of Vogel
902								S of Parrot D
903							40222	Parrot W
904	940				9N3R2		41218	Argelander A
905					N45R3	118	41247	Airy P
906	941	416		7	9M8R6	51L	41229	Airy A
907			316		9N3R4		41259	Airy S
908	937				9P0R6	111	40310	Parrot L
909	90		353				40356	Faye A
910			319				41347	Playfair E
911							41431	Playfair D
912	89		341			116	40471	Blanchinus K
913		402					40430	La Caille A
914			360				40411	La Caille H
915	8	405		154				Werner D
916	982						41436	Apianus B
917							40530	Aliacensis E
918	1027					115	40564	Aliacensis G
919	1039	421					41544	Poisson K
920	1026						40577	Nonius A
921	1030	422					41539	Kaiser C
922			363				40605A	Inside Nasireddin
923	1077						40629	Li etus G
924	1085						41629	Faraday D
925	86					50L	40731	Licetus H
926								NW of Licetus L
927							40755	Heraclitus A

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
928	85		342			112	40844	Zach J
929							40815	Zach C
930							40828C	W Wall of Zach A
931							40913	Curtius A
932							40923	Curtius B
933							40937A	Sempronius J
934		412	314		8M0R5		41087	Saunder T
935	95	425						N Saunder A
936	887						42052	Theon Senior C
937	888		287		8M0R9	130	42060	Theon Senior A
938		426		146			42061	Theon Senior
939	96							SW Wall of Delambre
940	892				R48R1		42069	Taylor D
941	20	443		9	R48R2	56L	43100	Alfraganus C
942		428				124	42114	Dollond D
943							42108	Andel D
944					9M8R5	125	42212	Abulfeda R
945	950	429			G67R1		42148	Dollond
946	92						42167	Dollond E
947	951				G67R2		42198	Kant P
948	91				6M5R1	134	43223	Tacitus C
949					7N0R2		43219	Tacitus N
950							42263	Abulfeda BC
951					9M8R2		42207	Abulfeda M
952	948				9M8R4		42235A	SE of Abulfeda X
953	946	418		3			41278	Abulfeda A
954	944	417		4			41268	Abulfeda E
955							42237	Almanon F
956					7N0R1			Inside Almanon
957	957						42372	Almanon L

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
958	988					123	42315	Geber E
959							42317	Azophi C
960	978	419		2	9M8R1		41365	Abenezra B
961			275				42377	Sacrobosco P
962			277				42471	Sacrobosco W
963	992						41493	Pontanus K
964	984					L54	41476	Pontanus F
965	996					129	42560	Zagut F
966			310				41468	Apianus L
967							42553	Zagut P
968		437						WSW of Zagut P
969							41576	Gemma Frisius V
970	1031		309			119	41650	Gemma Frisius K
971	1038						41680	Gemma Frisius EB
972		438		30			42559	Busching E
973	82		279			126	42631	Buch B
974	1033		305				41654	Maurolycus B
975	1090		280				42618	W Wall of Barocius C
976			269				42638	N of Barocius B
977	1089		285			122	41790	Inside Barocius
978							42703	Breislak A
979							41748	Cuvier B
980	1113		294			52L	41841	Jacobi B
981							40894	Jacobi T
982			264				41865A	Kinau L
983	1125						40898	Pentland F
984	1126						40982	Pentland E
985							41935A	Schomberger Z
986	890						43040	Hypatia E
987	904				8L0R8	135	43047	Alfraganus D

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
988	901	456					44034	Torricelli C
989	55		213				44084	Torricelli B
990								S of Torricelli A
991	905				G65R1		43151	Zollner K
992								NE of Kant C
993			250		G65R2			Kant X
994	961	458			G63R1		44118	Theophilus B
995		460			C61R1			NW of Madler
996	969				6M0R1		44284	Beaumont L
997					6M5R2			Inside Cyrillus
998					6M5R3			Cyrillus E
999	964				6M5R4	137	44236	Cyrillus G
1000	965	461		15			44229	Beaumont D
1001						132		Fermat E
1002			231				44324	Beaumont J
1003	1002					138	44337	Polybius L
1004		462		118			44339	Polybius A
1005							44306	N Wall of Polybius
1006	73						43356A	W of Polybius F
1007		448					43430	Pons F
1008		449		119			43483	Polybius B
1009	75	463		111			44443	Piccolomini K
1010	997			120		57L	43418	Pons B
1011							43510	Zagut LA
1012	1053						43513	Zagut A
1013	1056		232				43582	Lindenau E
1014	1059	451					43584	Lindenau G
1015							43526	Rabbi Levi L
1016	1052		245			133	43525	Zagut S
1017	1045						42585	Celsius H

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
1018	1047		254				42671	Busching A
1019	81		239				43601	Rabbi Levi J
1020	1063						43651	Riccius M
1021	1101		233				43626	Nicolai D
1022			222				43723	Pitiscus T
1023	83						42752	Barocius EB
1024						128	42754	Barocius EC
1025	1096						42747A	Ideler C
1026							42749	NW of Ascelpi G
1027	1120						42852	Hommel K
1028						121	41894	Mutus K
1029							42825	Mutus P
1030	1117					127	42836	Hommel M
1031	1131		243				41879	Manzinus M
1032								SW of Censorinus
1033	913						46001	Censorinus W
1034							46005A	NW of Censorinus F
1035					N45R2	143	46036	Lubbock G
1036							46038A	Lubbock L
1037	64				G58R2		46101	Capella D
1038	922	469		73	R42R1	L61	45057	Isidorus D
1039	923				G61R4		45113	Isidorus C
1040	65				G61R3		45143	Isidorus A
1041							45186	Capella J
1042	972				G58R1		45188	Gaudibert D
1043	973					63L	46119	Gaudibert J
1044	971						45271	Daguerre K
1045			183		G61R2			Daguerre B
1046					6M0R4		45244	Daguerre X
1047							45264	Daguerre Y

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
1048	975	473		130	6M0R3	59L	45340	Rosse
1049			195		6M0R2			N of Fracastorius S
1050	71							Inside Fracastorius
1051			163				45368B	SE Fracastorius B
1052							45433	Weinek D
1053	29	466		112			44494	Piccolomini L
1054								Inside Piccolomini
1055		474					45500	Piccolomini P
1056							45541A	Neander A
1057							45521	Neander V
1058			165				45514	Neander X
1059	1074		162			140	45516	Neander Y
1060	1068		194				44538	Stiborius F
1061	79						44660A	Stiborius G
1062			207				43686	Riccius R
1063							44662	Brenner S
1064			157					W of Fabricius
1065	80						43770	Lockyer HA
1066								W of Lockyer
1067	1124						43777	Vlacq K
1068	1122						43726A	Pitiscus A
1069			206			131	43718	Hommel HA
1070							43824	Nearch J
1071			203				42865	Hommel E
1072	1133		182				42867	Nearch E
1073	1258		134		927R1		46081	Secchi X
1074	1257		116		927R2	144	47026	Messier D
1075	1267				N42R1			NW of Goclenius A
1076					N45R1			E of Lubbock
1077	928	479		62			46135	Gutenberg A

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
1078			135				46183	E of Gutenberg E
1079	1277		110				47138	E of Goclenius
1080	1278		121					Magelhaens J
1081		492		16			47221	Bellot
1082			112		6L0R4		47213	Bellot B
1083	1350				6L0R3		47236	McClure B
1084							46297	Colombo K
1085					6L5R2		46225	Bohnenberger J
1086	67	480			6L5R1	142	46219	Bohnenberger G
1087	1286		105		6L0R2		47312	Cook G
1088	70						46357A	NW of Santbech E
1089							46401	Santbech B
1090	1293						46464	Borda F
1091	1354						46468	Reichenbach H
1092	76					62L	45498	Reichenbach K
1093	1307	485					46542	Reichenbach G
1094		475					45574	Neander H
1095	1361						46517	Rheita F
1096	1312	476					45602	Brenner E
1097			103				45649	Metius C
1098								NW of Fabricius A
1099	1318		117			139	44766	Watt A
1100			106				44776	Watt B
1101							44821	Rosenberger H
1102			149				43862	Rosenberger F
1103							43920	Boussingault R
1104	61		63					W of Webb B
1105	1263		52				48051	Webb B
1106	1264		46		C10R2		48063	Webb H
1107			53		921R1		48141	Langrenus KA

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
1108			74		923R1		48100	Langrenus FE
1109		490		100			47099	Messier G
1110	63		92				47175	Goclenius UA
1111					921R2		48118	Langrenus D
1112								W of McClure δ
1113							47296	Vendelinus V
1114		494			4E0R2		47380	Cook F
1115	1294	493	93			64L	47318	Biot
1116							47413	Snellius Y
1117	1296						47426	Snellius X
1118	1356						47466	Petavius C
1119	77						47515	Furnerius A
1120	1359	486					46662	Fraunhofer G
1121							46631	Rheita L
1122			88				46604	Rheita H
1123							46607	Reimarus H
1124	1314						45770	Mallet E
1125							45736	Watt E
1126			61				45718	Watt K
1127							44843A	Biela G
1128			5		G45R1		49035A	Maclaurin MC
1129							49005B	Maclaurin EA
1130							18080	Webb L
1131	62	496			C10R1	66L	48069	Langrenus C
1132							49132	Maclaurin D
1133	1348				824R1		48183	Langrenus R
1134								W of Maclaurin DB
1135	1273	500		84	C06R1		49100	Langrenus M
1136			28				48263	Vendelinus T
1137			38		4E0R3		48246	Vendelinus H

No.	ACIC No.	Kiev No.	Man No.	Schrutka No.	Apollo No.	IAU No.	Arthur Cat. No.	Name
1138							48282	Lame W
1139	1291	498					48287	Lame M
1140	69		36			145	48331	Holden V
1141	1292						48335A	SE of Holden
1142							48442	Phillips F
1143							47478	Hase A
1144							47572	Adams B
1145							46673A	Fraunhofer X
1146							47545	Furnerius X
1147							46713	Vega A
1148								La Perouse A
1149			3					N of Kapteyn
1150							49235	Ansgarius C
1151	1349						49227	Behaim N
1152							49305	W of Hecataeus
1153	1298						48455	Phillips A
1154							48436	Legendre N
1155							46760	Peireseius A
1156							44825	Hagecius S

APPENDIX II

COORDINATES OF CONTROL FEATURES

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
1	5.148	-51.451	1735.815	.182	-1352.060	155.759	1077.369
2	21.534	-52.097	1735.449	.311	-1273.779	637.012	991.708
3	20.031	-32.809	1737.535	.174	-884.514	595.166	1372.021
4	17.069	-21.464	1737.281	.081	-607.686	509.929	1545.585
5	5.941	-26.688	1737.451	.271	-776.148	179.840	1544.017
6	.189	-31.089	1737.612	.364	-897.232	5.724	1488.032
7	1.964	-12.011	1738.248	.440	-361.515	59.583	1699.195
8	-3.189	-5.171	1738.345	.139	-156.439	-96.693	1728.590
9	1.185	.395	1738.259	.333	11.969	35.942	1737.846
10	13.248	6.997	1737.908	.792	206.068	398.273	1679.059
11	23.596	4.530	1738.978	.371	125.849	696.099	1588.601
12	18.707	-8.676	1736.965	.300	-248.181	557.083	1626.380
13	31.299	-14.761	1735.916	.290	-377.917	901.819	1434.331
14	35.352	-26.578	1736.359	.341	-633.631	1004.653	1266.542
15	37.807	-37.189	1736.099	.349	-829.102	1064.228	1092.724
16	47.630	-42.656	1735.992	.347	-792.738	1282.556	860.397
17	51.353	-29.234	1736.127	.429	-529.518	1355.935	946.143
18	52.146	-6.248	1737.160	.314	-116.007	1371.623	1059.678
19	39.357	-.142	1735.758	.117	-3.318	1100.729	1342.103
20	51.578	10.522	1735.527	.188	196.957	1359.709	1060.402
21	51.522	30.566	1735.227	.337	549.048	1358.422	929.650
22	41.762	26.173	1737.221	.432	571.576	1157.050	1162.958
23	41.056	46.539	1736.520	.164	950.453	1140.547	900.718
24	31.700	29.512	1735.792	.239	727.496	912.102	1285.221
25	30.552	14.187	1735.112	.318	366.210	881.985	1448.656
26	24.768	21.013	1735.196	.168	564.959	726.960	1470.801
27	6.948	13.222	1737.831	.082	394.579	210.223	1679.336
28	-4.042	7.628	1738.555	.308	230.213	-122.551	1718.883

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
29	-12.825	12.239	1738.572	.194	359.372	-385.923	1656.667
30	-17.605	4.461	1738.438	.166	128.883	-525.802	1651.995
31	-17.980	-6.063	1736.523	.170	-174.460	-536.023	1642.484
32	-13.588	-17.056	1736.593	.289	-495.086	-408.000	1613.747
33	-9.379	-25.764	1736.542	.311	-744.734	-282.999	1543.003
34	-7.114	-39.148	1736.694	.276	-1087.974	-215.089	1336.471
35	-3.169	-44.867	1736.424	.205	-1223.101	-96.003	1228.810
36	-5.209	-58.350	1735.999	.255	-1471.704	-157.622	907.158
37	-17.199	-53.473	1737.458	.630	-1333.752	-513.739	987.895
38	-27.019	-52.554	1737.908	.331	-1229.168	-789.518	941.346
39	-24.495	-41.122	1736.073	.425	-1038.983	-719.798	1190.107
40	-33.443	-31.350	1737.871	.234	-754.458	-957.762	1238.419
41	-40.969	-58.630	1737.665	.784	-1120.266	-1139.296	682.999
42	-47.138	-37.559	1737.058	.458	-720.279	-1273.258	936.686
43	-52.372	-26.222	1737.590	.252	-468.735	-1376.157	951.681
44	-25.271	-11.101	1735.983	.359	-302.268	-741.082	1540.477
45	-33.140	6.854	1737.788	.170	173.644	-950.023	1444.718
46	-49.951	11.778	1737.680	.228	228.235	-1330.185	1094.554
47	-42.432	23.623	1737.553	.416	513.896	-1172.354	1174.983
48	-46.161	42.313	1734.896	.617	808.919	-1251.372	888.583
49	-37.931	44.479	1737.665	.539	960.298	-1068.159	977.929
50	-17.295	51.706	1736.420	.442	1301.194	-516.234	1027.401
51	-1.996	46.993	1735.220	.272	1268.142	-60.427	1182.858
52	13.147	61.744	1733.641	.660	1487.032	394.316	799.226
53	27.278	50.684	1736.667	.141	1194.167	795.941	977.986
54	14.361	36.802	1736.470	.410	1007.722	430.706	1346.965
55	4.919	32.270	1737.116	.427	924.049	148.962	1463.392
56	-.568	24.181	1736.506	.120	711.268	-17.213	1584.063
57	-11.752	33.128	1734.966	.343	928.313	-353.365	1422.488
58	-20.342	27.144	1737.699	.419	743.340	-604.057	1449.883
59	-22.968	15.842	1737.204	.237	436.640	-677.887	1538.731
60	-28.825	24.371	1738.731	.219	628.579	-838.314	1387.553

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
61	1.236	1.484	1737.792	.610	44.979	37.500	1736.805
62	1.743	5.198	1738.215	.214	157.410	52.886	1730.264
63	1.624	6.817	1739.506	.282	206.405	49.298	1726.512
64	2.699	9.668	1738.255	.749	291.612	81.851	1711.664
65	3.497	5.961	1738.569	.330	180.207	106.04.	1725.950
66	3.278	2.469	1737.843	.169	74.750	99.376	1733.388
67	4.009	1.132	1738.386	.416	34.256	121.54?	1733.793
68	7.618	5.082	1737.916	.206	152.587	230.401	1715.804
69	7.703	8.337	1737.051	.267	249.584	232.829	1703.186
70	10.136	.353	1737.877	.268	10.541	305.831	1710.722
71	11.414	4.350	1737.118	.324	129.163	343.766	1697.858
72	14.088	3.301	1736.983	.385	97.000	422.808	1681.944
73	18.716	3.113	1737.899	.350	89.373	557.665	1643.568
74	17.812	8.653	1736.962	.6??	248.795	531.315	1634.883
75	19.806	6.332	1737.143	.187	180.255	588.608	1624.412
76	22.096	8.970	1736.485	.469	250.864	653.206	1589.268
77	24.080	9.469	1735.868	.265	260.720	708.242	1563.219
78	24.370	8.619	1736.090	.323	236.994	716.353	1563.547
79	25.016	6.580	1737.935	.320	180.480	734.936	1564.516
80	22.623	2.314	1740.117	.463	64.862	659.364	1604.914
81	25.480	1.706	1736.407	.328	46.658	746.991	1566.824
82	29.247	1.078	1736.242	.312	28.489	848.275	1514.646
83	28.613	7.017	1736.245	.459	186.211	831.461	1512.794
84	30.070	7.166	1735.194	.390	187.323	869.424	1489.937
85	31.227	5.456	1735.372	.515	141.111	899.660	1477.233
86	33.039	7.542	1735.781	.239	190.991	946.372	1442.510
87	33.652	4.565	1735.614	.353	114.989	961.793	1440.169
88	40.511	4.780	1736.877	.409	110.052	1128.256	1315.929
89	41.367	3.770	1736.051	.164	85.663	1147.321	1300.073
90	41.736	7.801	1736.569	.235	175.884	1156.038	1283.867
91	44.011	4.428	1735.443	.566	96.373	1205.783	1244.413
92	49.352	5.804	1735.574	.368	114.326	1316.821	1124.779

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
93	50.583	8.917	1735.282	.296	170.785	1340.595	1088.505
94	56.438	5.704	1735.430	.100	95.357	1446.111	954.665
95	61.316	5.223	1735.525	.413	75.826	1522.544	829.551
96	63.060	6.889	1736.140	.342	94.345	1547.740	780.887
97	65.074	7.563	1736.368	.997	96.322	1574.626	725.429
98	61.623	9.120	1736.765	.350	130.838	1528.074	814.909
99	.191	14.120	1738.465	.144	424.093	5.806	1685.934
100	.972	18.765	1738.583	.542	559.206	29.506	1645.931
101	1.580	11.877	1738.204	.655	357.598	47.934	1700.347
102	3.961	15.100	1738.580	.285	451.814	120.096	1674.546
103	4.929	17.071	1736.475	.568	507.875	149.209	1653.827
104	6.218	12.540	1738.612	.458	375.267	188.317	1687.153
105	7.329	15.347	1737.576	.643	456.127	221.648	1661.924
106	7.238	18.984	1736.771	.201	560.475	218.803	1629.223
107	8.719	17.599	1737.688	.484	519.320	263.400	1637.220
108	9.484	12.646	1737.529	.344	375.204	286.297	1672.203
109	11.626	18.944	1736.828	.323	552.277	350.011	1609.053
110	13.060	15.872	1738.823	.165	463.263	392.925	1629.264
111	11.136	14.420	1737.879	.458	424.627	335.665	1651.438
112	16.656	19.213	1735.159	.382	547.059	497.352	1569.759
113	17.091	13.409	1736.024	.228	384.801	510.212	1614.122
114	16.934	10.729	1737.933	.162	309.517	506.192	1633.518
115	19.659	15.471	1734.482	.397	435.694	583.526	1574.197
116	21.157	14.742	1735.848	.411	411.943	626.521	1565.549
117	21.746	17.941	1735.237	.224	496.470	642.899	1533.377
118	26.590	16.450	1735.008	.291	439.341	776.604	1487.991
119	23.046	12.960	1734.891	.274	358.036	679.143	1555.770
120	27.353	19.875	1734.923	.173	523.872	797.155	1449.158
121	28.755	17.122	1735.027	.185	447.816	834.669	1453.653
122	28.996	14.387	1735.446	.128	377.158	841.249	1470.315
123	27.759	11.806	1735.416	.316	314.207	808.267	1503.212
124	30.444	10.778	1735.954	.379	279.875	879.590	1470.214

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
125	31.657	20.134	1735.630	.585	508.550	910.903	1387.099
126	32.340	13.959	1735.690	.317	353.740	928.505	1423.153
127	33.786	13.796	1734.724	.539	343.810	964.679	1400.163
128	35.912	13.327	1735.306	.296	323.971	1017.839	1367.602
129	36.094	10.119	1736.489	.352	246.531	1022.976	1381.352
130	38.949	11.908	1738.544	.150	278.989	1092.898	1322.979
131	40.286	15.184	1736.335	.363	346.921	1122.728	1278.275
132	42.364	16.348	1737.001	.397	361.241	1170.453	1231.550
133	43.345	13.240	1737.166	.247	289.348	1192.366	1229.750
134	45.415	18.788	1736.270	.257	392.532	1236.582	1153.870
135	52.028	12.561	1734.650	.470	232.106	1367.448	1041.739
136	50.211	12.992	1735.888	.394	249.756	1333.871	1082.460
137	53.918	11.273	1735.257	.417	199.785	1402.390	1002.250
138	57.028	18.101	1735.781	.171	293.501	1456.215	897.903
139	59.998	18.982	1736.100	.238	282.366	1503.478	820.892
140	62.116	19.682	1735.836	.685	273.424	1534.296	764.394
141	67.198	19.318	1736.878	.335	222.671	1601.139	635.228
142	70.171	20.990	1736.694	.552	211.031	1633.721	550.027
143	3.457	20.824	1735.735	.509	615.928	104.672	1619.399
144	3.108	22.756	1735.915	.401	670.484	94.109	1598.435
145	2.316	26.710	1735.411	.341	779.387	70.142	1548.964
146	1.997	28.963	1735.666	.621	839.974	60.487	1517.670
147	6.483	26.984	1736.705	.350	782.965	196.077	1537.746
148	5.363	30.394	1736.600	.318	874.773	162.302	1491.378
149	6.931	22.415	1735.763	.252	657.043	209.470	1592.887
150	8.528	22.718	1735.907	.377	662.981	257.425	1583.528
151	9.318	26.023	1736.276	.491	751.717	281.129	1539.657
152	10.687	26.700	1736.463	.220	766.691	322.020	1524.399
153	3.252	29.711	1736.048	.360	859.030	98.465	1505.401
154	10.707	24.883	1735.830	.357	717.659	322.505	1547.275
155	11.519	29.694	1736.210	.323	842.744	346.708	1477.836
156	14.488	27.844	1736.209	.179	785.126	434.356	1486.383

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
157	13.002	24.168	1736.447	.286	692.685	390.676	1543.635
158	10.269	21.831	1735.213	.578	634.945	309.336	1584.967
159	13.483	21.094	1736.052	.313	607.591	404.771	1575.077
160	14.341	20.242	1737.376	.227	582.376	430.347	1579.277
161	15.353	23.619	1735.184	.734	670.385	459.420	1533.095
162	15.727	28.459	1736.129	.545	796.339	470.572	1469.200
163	16.250	29.194	1735.971	.540	812.928	485.785	1454.908
164	18.664	29.286	1735.673	.492	804.375	555.456	1434.228
165	21.705	29.807	1735.732	.351	801.613	641.931	1399.324
166	22.393	26.443	1734.820	.477	714.276	660.897	1436.184
167	19.707	22.538	1734.805	.615	625.989	584.982	1508.469
168	21.149	20.603	1734.884	.259	569.378	625.946	1514.537
169	23.259	29.148	1735.193	.218	776.470	685.213	1392.289
170	25.638	25.359	1735.420	.283	670.091	750.876	1413.805
171	29.720	21.057	1735.194	.290	541.447	860.236	1406.315
172	30.045	24.911	1735.695	.533	632.845	869.022	1362.697
173	32.817	27.123	1735.928	.538	665.108	940.789	1298.458
174	33.226	24.169	1735.291	.186	594.328	950.829	1324.362
175	36.040	22.796	1736.531	.331	544.045	1021.045	1294.483
176	38.133	20.593	1736.426	.633	480.406	1072.227	1278.559
177	39.835	24.014	1736.334	.549	542.608	1112.261	1217.911
178	42.729	23.513	1736.336	.823	508.856	1178.154	1169.564
179	45.836	20.110	1737.025	.307	416.093	1246.048	1136.437
180	37.068	25.882	1735.645	.364	604.530	1046.175	1246.003
181	39.501	29.698	1735.679	.294	663.520	1104.054	1163.352
182	41.827	29.648	1737.250	.401	640.365	1158.534	1125.063
183	46.886	30.974	1735.864	.494	610.573	1267.172	1017.201
184	53.995	22.297	1735.284	.335	387.031	1403.785	943.826
185	52.905	26.841	1735.555	.214	472.625	1384.349	933.998
186	53.509	27.272	1735.419	.274	472.899	1395.191	917.326
187	57.799	24.511	1735.857	.283	383.783	1468.940	841.708
188	59.232	25.340	1736.493	.487	380.197	1492.072	802.857

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
189	64.792	29.719	1737.672	.856	366.894	1572.191	642.735
190	66.021	29.197	1736.278	.695	344.216	1586.430	615.966
191	67.415	26.870	1736.774	.471	301.478	1603.576	595.011
192	-.021	36.615	1737.373	.540	1036.227	-.642	1394.525
193	3.431	36.955	1736.874	.431	1042.303	103.953	1385.470
194	3.516	33.094	1737.571	.291	946.958	106.552	1452.952
195	6.836	33.085	1737.114	.337	941.526	206.755	1445.111
196	7.643	35.063	1736.905	.392	988.960	231.016	1409.052
197	8.876	31.591	1737.610	.234	899.358	268.096	1462.384
198	10.334	33.720	1736.813	.343	948.536	311.546	1421.175
199	9.501	37.325	1737.743	.199	1039.205	286.854	1362.907
200	7.562	38.565	1737.081	.378	1073.487	228.584	1346.412
201	14.705	30.096	1736.468	.655	842.245	440.783	1453.153
202	13.908	34.614	1736.897	.382	957.702	417.495	1387.557
203	14.374	38.478	1736.697	.385	1046.776	431.148	1316.999
204	15.157	39.403	1736.845	.823	1064.141	454.132	1295.376
205	20.019	36.297	1736.872	.653	966.050	594.596	1315.268
206	22.394	37.861	1736.346	.869	987.525	661.492	1265.747
207	23.300	34.706	1736.552	.582	908.105	686.883	1311.162
208	23.689	32.808	1737.005	.551	861.843	697.891	1336.922
209	25.305	34.589	1737.048	.665	891.471	742.475	1292.804
210	25.782	36.345	1734.068	.310	925.385	754.221	1257.697
211	27.650	37.049	1737.066	.867	927.043	806.128	1228.065
212	27.767	30.270	1736.354	.673	774.478	808.927	1326.931
213	29.833	31.581	1736.583	.740	788.934	863.895	1283.350
214	31.597	36.872	1738.150	.642	888.339	910.679	1184.350
215	35.476	36.895	1736.666	.503	849.065	1007.889	1131.042
216	35.567	34.252	1736.147	.198	794.863	1009.840	1167.313
217	34.353	30.003	1736.213	.299	716.748	979.727	1241.307
218	36.605	31.819	1735.917	.210	734.723	1035.119	1184.110
219	37.118	39.668	1738.502	.264	885.289	1049.106	1066.785
220	38.262	37.766	1736.871	.177	835.233	1075.574	1078.076

POINT NO	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (K.M)	SPHERICAL STANDARD ERROR (K.M)	X (K.M)	Y (K.M)	Z (K.M)
221	38.709	34.000	1736.503	.095	757.733	1085.942	1123.394
222	42.907	33.883	1736.128	.546	708.944	1181.977	1055.685
223	42.743	35.356	1736.637	.222	738.026	1178.666	1040.180
224	42.110	36.410	1736.759	.370	764.768	1164.591	1036.914
225	44.122	36.427	1736.438	.328	740.177	1208.895	1002.960
226	44.780	39.697	1737.206	.424	787.613	1223.675	948.773
227	46.458	39.258	1734.947	.870	756.318	1257.611	925.439
228	45.796	38.783	1735.924	.380	758.109	1244.408	943.476
229	46.872	33.066	1736.431	.602	647.684	1267.288	994.827
230	51.010	35.205	1735.446	.356	629.488	1348.889	892.197
231	58.555	39.873	1736.795	.477	580.864	1481.724	695.374
232	58.544	34.067	1735.194	.628	507.237	1480.185	750.107
233	61.608	32.479	1736.541	.467	443.407	1527.661	696.576
234	67.389	31.517	1737.189	.759	349.148	1603.659	569.384
235	62.898	31.151	1737.650	.724	409.498	1546.858	677.473
236	67.548	35.232	1736.064	.650	382.482	1604.472	541.568
237	68.169	41.498	1737.307	.655	428.062	1612.717	483.879
238	.347	49.882	1735.770	.366	1327.350	10.523	1118.449
239	1.866	49.510	1735.567	.429	1319.223	56.508	1126.343
240	3.321	46.705	1734.814	.316	1260.529	100.497	1187.664
241	1.721	44.362	1736.089	.506	1213.316	52.141	1240.625
242	3.689	41.533	1736.372	.511	1148.928	111.723	1297.101
243	5.533	40.244	1736.149	.297	1116.398	167.381	1319.035
244	7.647	42.962	1736.402	.345	1172.858	231.075	1259.405
245	6.215	45.985	1735.676	.554	1240.890	187.913	1198.938
246	7.274	49.920	1735.776	.360	1317.444	219.759	1108.586
247	13.217	49.354	1738.303	.282	1283.995	397.458	1102.307
248	14.235	46.016	1736.571	.396	1211.163	427.031	1168.934
249	11.815	44.504	1736.377	.528	1191.333	355.538	1212.156
250	13.351	42.240	1737.301	.492	1136.316	401.165	1251.426
251	16.113	41.398	1737.583	.345	1103.892	482.226	1252.229
252	18.391	46.576	1736.967	.138	1197.108	548.013	1132.991

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
253	20.936	40.832	1737.488	.368	1061.050	620.852	1227.835
254	23.599	42.147	1737.556	.802	1068.449	695.608	1180.523
255	22.483	48.572	1735.426	.231	1202.305	663.653	1061.004
256	27.454	47.040	1737.184	.494	1128.134	800.915	1050.550
257	25.420	43.321	1736.126	.579	1075.815	745.235	1140.780
258	30.828	48.609	1736.149	.595	1118.444	889.723	985.744
259	32.845	46.035	1736.848	.601	1050.269	942.022	1013.001
260	34.280	47.429	1736.514	.662	1056.703	978.061	970.698
261	35.124	42.049	1737.160	.499	951.636	999.466	1055.075
262	37.138	43.775	1735.830	.607	957.348	1047.975	999.168
263	39.043	40.101	1737.532	.324	869.?56	1094.475	1032.247
264	42.772	40.257	1736.683	.340	823.814	1179.352	972.898
265	42.421	44.741	1735.960	.231	902.048	1171.031	910.248
266	41.810	49.144	1735.888	.238	978.624	1157.247	846.393
267	45.505	48.598	1735.676	.471	912.444	1238.070	804.487
268	45.129	45.118	1737.186	.305	868.417	1231.143	864.844
269	47.395	43.982	1735.589	.576	815.881	1277.465	845.393
270	48.657	43.693	1736.519	.31?	792.396	1303.729	829.397
271	51.318	41.028	1736.108	.514	712.261	1355.250	818.566
272	53.856	38.284	1735.445	.2?0	634.183	1401.434	803.468
273	52.443	45.217	1736.374	.365	751.232	1376.513	745.558
274	65.480	42.038	1736.857	.420	482.679	1580.219	535.350
275	61.760	45.675	1736.187	.586	587.689	1529.537	574.006
276	2.238	54.349	1734.994	.528	1408.756	67.746	1010.456
277	.668	51.580	1735.433	.298	1359.568	20.246	1078.373
278	3.320	57.091	1735.052	.264	1454.184	100.475	941.093
279	5.583	54.794	1735.481	.589	1411.300	168.843	995.800
280	8.109	52.623	1735.204	.794	1365.100	244.767	1042.843
281	10.814	59.098	1733.949	.670	1461.393	325.331	874.681
282	11.790	55.687	1734.028	.213	1402.039	354.308	956.871
283	13.793	52.396	1733.942	.669	1334.086	413.402	1027.554
284	14.601	56.836	1733.595	.412	1404.341	437.025	917.708

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
285	15.904	50.704	1734.385	.612	1290.833	475.261	1056.393
286	19.382	53.522	1733.143	.181	1314.613	575.180	971.981
287	20.351	50.001	1737.617	.286	1248.024	604.304	1047.169
288	22.448	57.677	1733.914	.118	1354.214	662.084	856.858
289	23.815	57.877	1736.334	.244	1345.296	701.116	844.671
290	24.734	56.331	1736.726	.275	1312.798	726.654	874.501
291	24.745	52.569	1735.074	.377	1251.294	726.262	957.752
292	27.155	55.882	1735.231	.419	1278.225	791.953	866.014
293	26.893	56.969	1734.769	.440	1297.108	784.675	843.337
294	29.485	58.959	1737.659	.680	1296.009	855.257	779.986
295	33.899	58.718	1737.435	.646	1232.465	969.017	748.809
296	38.162	53.143	1735.830	.242	1092.044	1072.546	818.652
297	40.713	55.852	1736.805	.545	1089.505	1132.867	738.972
298	43.559	52.729	1736.277	.168	1001.268	1196.464	761.967
299	44.056	57.006	1736.715	.785	1046.816	1207.653	679.653
300	46.232	56.663	1735.733	.559	1003.106	1253.459	659.840
301	51.176	52.196	1736.923	.462	860.386	1353.190	667.469
302	56.430	55.657	1736.998	.680	793.052	1447.276	541.865
303	50.063	47.860	1736.229	.345	826.455	1331.252	747.819
304	59.029	52.998	1736.105	.628	713.489	1488.586	537.683
305	61.804	50.440	1736.689	.461	632.619	1530.608	522.610
306	-.259	67.878	1735.746	.514	1607.948	-7.855	653.647
307	.974	61.082	1735.472	.358	1518.854	29.501	839.090
308	2.858	65.387	1735.477	.250	1575.827	86.541	721.913
309	4.283	68.262	1736.627	.389	1608.624	129.696	641.388
310	6.558	61.773	1736.836	.528	1520.283	198.363	816.081
311	7.773	64.854	1736.787	.957	1557.741	234.904	731.223
312	11.394	68.201	1735.449	.665	1579.587	342.857	631.768
313	7.505	60.284	1735.838	.532	1494.651	226.711	853.083
314	13.197	60.271	1734.212	.455	1466.189	395.923	837.272
315	17.199	60.110	1733.884	.350	1436.031	512.691	825.417
316	17.149	64.087	1734.068	.492	1490.382	511.310	724.095

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
317	19.183	67.254	1734.784	.546	1511.038	570.015	633.497
318	23.292	62.086	1735.655	.843	1408.717	686.317	746.313
319	25.552	64.856	1736.230	.487	1417.981	748.891	665.572
320	22.967	69.295	1735.515	.529	1494.731	677.212	564.953
321	29.678	69.780	1737.275	.362	1416.355	860.181	521.682
322	30.757	63.766	1735.508	.644	1337.788	887.527	659.245
323	33.165	68.131	1737.702	.742	1349.955	950.609	541.821
324	35.815	66.552	1736.318	.275	1291.726	1016.039	560.276
325	37.325	59.984	1736.913	.977	1195.971	1053.151	690.936
326	41.020	65.880	1736.641	.432	1195.861	1139.806	535.425
327	43.439	66.152	1736.429	.673	1153.179	1193.940	509.772
328	45.903	64.309	1737.473	.599	1089.542	1247.792	524.141
329	49.199	63.499	1736.911	.406	1015.712	1314.803	506.441
330	53.607	66.480	1736.169	.862	944.524	1397.554	411.091
331	2.764	73.676	1736.402	.394	1664.468	83.718	487.475
332	6.553	73.043	1737.647	.885	1651.244	198.317	503.465
333	9.081	73.220	1737.725	.518	1642.878	274.258	495.401
334	13.380	74.683	1737.040	.614	1629.868	401.967	446.388
335	17.582	73.443	1738.613	.781	1588.679	525.176	472.292
336	23.185	71.005	1737.117	.388	1509.879	683.894	519.738
337	25.902	71.694	1736.150	.396	1482.705	758.407	490.529
338	2.219	-.943	1738.049	.244	-28.599	67.287	1736.510
339	2.378	-2.604	1738.070	.554	-78.902	72.111	1734.780
340	3.769	-4.830	1738.597	.912	-146.083	114.275	1728.676
341	1.778	-7.396	1738.571	.468	-223.707	53.950	1723.274
342	5.646	-8.674	1739.030	.433	-260.991	171.092	1710.800
343	6.360	-3.541	1738.413	.222	-106.697	192.560	1724.417
344	9.003	-1.159	1738.973	.498	-34.732	272.113	1717.200
345	8.746	-3.064	1738.350	.579	-91.848	264.322	1715.680
346	8.506	-6.091	1739.010	.653	-182.480	257.212	1710.175
347	12.225	-6.501	1737.484	.364	-192.255	367.919	1687.164
348	14.025	-4.987	1738.024	.756	-146.569	421.206	1679.830

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
349	14.905	-1.934	1737.478	.154	-56.677	446.921	1678.058
350	17.178	-1.852	1739.861	.272	-53.710	513.851	1661.382
351	15.746	-4.504	1738.898	.591	-131.431	471.888	1668.476
352	15.789	-7.704	1737.733	.327	-224.161	472.817	1657.079
353	12.685	-9.289	1738.065	.835	-273.709	381.655	1673.407
354	19.193	-5.565	1736.782	.560	-159.054	570.975	1632.513
355	19.815	-1.890	1738.556	.772	-53.958	589.340	1634.730
356	25.032	-2.596	1737.413	.286	-71.299	735.141	1572.605
357	24.200	-7.811	1736.633	.416	-215.276	711.871	1569.327
358	27.366	-9.433	1736.479	.258	-252.759	798.213	1521.291
359	31.018	-7.992	1736.414	.218	-206.888	894.797	1473.659
360	28.052	-6.400	1737.105	.663	-170.883	816.902	1523.484
361	30.293	-5.006	1735.670	.183	-130.778	875.501	1492.965
362	28.513	-2.404	1736.000	.513	-63.974	828.683	1524.102
363	27.829	-.344	1736.570	.188	-9.231	810.702	1535.693
364	31.621	-1.510	1736.440	.193	-38.973	910.416	1478.124
365	32.184	-2.678	1736.580	.408	-68.665	924.971	1468.136
366	32.984	-3.992	1735.388	.198	-101.336	944.761	1452.146
367	32.876	-8.783	1736.281	.310	-222.661	942.479	1441.120
368	34.805	-1.899	1735.342	.469	-47.225	990.517	1424.098
369	36.512	-6.917	1735.663	.146	-167.996	1032.696	1384.862
370	39.599	-9.931	1735.877	.241	-230.685	1106.470	1317.489
371	39.273	-5.600	1735.905	.341	-131.131	1098.861	1337.413
372	40.504	-3.346	1736.544	.621	-77.063	1127.890	1318.147
373	43.481	-.413	1735.743	.135	-9.074	1194.382	1259.432
374	44.672	-7.527	1735.682	.173	-161.692	1220.269	1223.680
375	43.389	-7.886	1736.761	.228	-173.173	1193.063	1250.180
376	47.245	-6.632	1735.582	.302	-136.083	1274.370	1170.345
377	46.797	-3.589	1735.436	.668	-74.371	1265.013	1185.726
378	49.593	-7.369	1736.038	.536	-144.330	1321.913	1116.039
379	51.611	-9.059	1735.362	.190	-169.674	1360.205	1064.205
380	51.369	-.259	1736.086	.653	-4.899	1356.194	1083.840

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
381	55.167	-2.007	1735.799	.408	-34.724	1424.784	990.850
382	56.967	-8.995	1735.958	.169	-147.955	1455.358	934.661
383	59.940	-6.767	1735.180	.752	-102.419	1501.804	863.101
384	67.022	-.362	1737.412	.929	-4.290	1599.550	678.245
385	64.186	-.638	1735.958	.207	-8.417	1562.736	755.867
386	67.084	-8.074	1736.993	.567	-94.999	1599.904	669.646
387	75.426	-7.718	1738.061	.981	-58.733	1682.134	433.394
388	.976	-18.725	1737.897	.373	-557.817	29.611	1645.675
389	3.282	-15.248	1737.875	.507	-456.306	99.483	1673.947
390	3.331	-11.787	1737.547	.430	-354.330	100.949	1698.037
391	6.898	-18.250	1737.939	.170	-540.330	208.733	1638.568
392	6.937	-11.637	1737.513	.179	-347.904	209.853	1689.342
393	9.433	-13.859	1738.605	.387	-410.817	284.939	1665.168
394	11.834	-13.587	1737.732	.185	-399.563	356.358	1653.200
395	11.887	-17.670	1738.445	.374	-516.373	358.085	1620.902
396	14.023	-19.601	1737.780	.471	-565.605	421.070	1588.292
397	17.439	-10.877	1736.567	.204	-312.632	520.433	1626.984
398	20.487	-16.482	1736.920	.572	-461.632	607.900	1560.206
399	24.637	-17.117	1736.082	.145	-464.458	723.727	1508.138
400	24.838	-15.333	1736.269	.318	-416.644	729.312	1519.586
401	24.804	-14.178	1736.420	.131	-386.069	728.449	1528.223
402	27.783	-12.151	1736.219	.396	-323.058	811.697	1500.413
403	26.474	-18.436	1737.939	.254	-491.984	774.749	1475.855
404	27.428	-18.833	1736.470	.418	-497.532	799.876	1458.762
405	32.969	-15.987	1736.582	.371	-401.276	945.015	1400.585
406	37.241	-13.145	1736.072	.100	-314.310	1050.609	1345.873
407	38.162	-17.289	1736.415	.294	-405.745	1072.921	1303.591
408	43.466	-11.275	1735.418	.272	-246.272	1193.829	1235.232
409	42.410	-16.973	1735.750	.273	-374.112	1170.646	1225.747
410	45.541	-19.822	1735.620	.170	-412.227	1238.801	1143.597
411	46.497	-15.346	1736.122	.570	-316.283	1259.276	1152.522
412	46.863	-14.137	1735.834	.360	-289.885	1266.673	1150.924

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
413	46.619	-10.403	1735.393	.336	-215.227	1261.292	1172.353
414	49.778	-16.164	1735.046	.396	-311.909	1324.785	1076.123
415	51.537	-15.200	1735.512	.245	-283.035	1358.930	1041.732
416	54.612	-11.261	1735.798	.261	-196.299	1415.100	985.877
417	57.253	-17.800	1735.056	.298	-286.919	1459.291	893.625
418	60.328	-18.593	1735.322	.314	-273.897	1507.778	814.204
419	64.194	-17.213	1735.687	.553	-223.593	1562.593	721.746
420	1.212	-27.821	1737.566	.464	-810.754	36.740	1536.380
421	1.957	-25.394	1738.063	.494	-744.922	59.363	1569.213
422	3.373	-21.400	1737.167	.343	-632.766	102.207	1614.593
423	4.160	-21.870	1738.479	.271	-645.880	126.110	1609.113
424	7.601	-22.218	1738.795	.370	-651.710	229.990	1595.552
425	12.875	-28.871	1738.977	.370	-818.524	387.476	1484.561
426	12.235	-26.761	1737.885	.511	-764.747	368.289	1516.500
427	11.630	-26.336	1738.424	.250	-755.404	350.440	1525.999
428	12.803	-22.935	1739.188	.214	-660.902	385.410	1561.871
429	15.262	-28.278	1738.931	.310	-794.762	457.750	1477.396
430	14.605	-23.352	1739.202	.226	-667.120	438.539	1545.140
431	17.348	-27.126	1737.220	.937	-756.052	517.987	1475.807
432	21.393	-28.912	1737.924	.222	-782.332	633.937	1416.497
433	21.723	-23.663	1737.362	.389	-647.773	643.033	1478.285
434	20.455	-21.698	1737.171	.417	-601.756	607.094	1512.313
435	26.453	-21.454	1736.888	.266	-568.764	773.715	1447.290
436	25.327	-28.531	1736.755	.231	-749.797	742.946	1379.187
437	28.509	-23.407	1737.337	.410	-606.473	829.235	1401.035
438	30.369	-20.828	1737.030	.237	-532.874	878.189	1400.750
439	31.076	-23.683	1736.368	.387	-597.360	896.276	1361.920
440	32.629	-25.006	1736.480	.293	-618.191	936.302	1325.346
441	33.754	-24.061	1735.966	.358	-588.460	964.564	1317.918
442	35.092	-22.851	1736.217	.109	-551.685	998.127	1309.136
443	37.945	-21.255	1736.213	.321	-496.345	1067.605	1276.048
444	40.479	-24.130	1735.846	.329	-539.779	1126.847	1204.995

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
445	43.729	-26.882	1735.949	.273	-567.191	1199.964	1118.883
446	43.575	-28.690	1735.884	.548	-603.737	1196.548	1103.207
447	47.235	-25.526	1736.719	.566	-508.154	1274.999	1064.119
448	45.414	-22.583	1735.244	.634	-467.780	1235.843	1124.697
449	50.673	-24.713	1736.055	.583	-459.972	1342.911	999.450
450	51.727	-21.029	1735.723	.381	-385.792	1362.662	1003.519
451	52.647	-23.935	1736.086	.509	-427.327	1380.042	962.742
452	54.479	-30.205	1735.343	.836	-507.229	1412.408	871.341
453	55.207	-25.705	1734.904	.632	-429.386	1424.727	892.005
454	55.000	-21.296	1735.915	.590	-361.620	1421.973	927.697
455	57.306	-25.153	1735.891	.647	-398.535	1460.865	848.739
456	59.320	-29.735	1735.222	.312	-439.138	1492.341	768.810
457	60.569	-27.839	1735.359	.255	-398.200	1511.413	754.014
458	61.939	-22.931	1734.840	.959	-317.960	1530.903	751.601
459	63.152	-28.831	1735.363	.800	-377.929	1548.308	686.582
460	64.401	-28.184	1736.121	.765	-354.286	1565.709	661.173
461	66.533	-31.462	1736.468	.601	-360.911	1592.847	589.831
462	.673	-36.353	1737.821	.375	-1030.030	20.423	1399.515
463	4.631	-35.769	1738.287	.249	-1012.748	140.358	1405.804
464	4.373	-30.686	1738.201	.343	-884.473	132.544	1490.463
465	7.147	-36.060	1738.230	.818	-1015.233	216.268	1394.264
466	8.294	-39.022	1737.679	.664	-1082.622	250.670	1335.898
467	9.265	-31.999	1738.242	.130	-909.096	279.845	1454.894
468	10.014	-30.165	1738.250	.114	-860.156	302.270	1479.958
469	12.556	-33.025	1738.348	.385	-924.745	377.911	1422.634
470	15.070	-34.923	1737.141	.481	-960.261	451.652	1375.344
471	15.602	-31.964	1738.388	.493	-886.369	467.549	1420.472
472	17.067	-39.760	1737.383	.235	-1062.259	509.904	1276.755
473	21.274	-39.751	1736.925	.329	-1034.992	630.208	1244.403
474	20.903	-36.854	1737.671	.700	-973.629	619.989	1298.906
475	21.105	-34.026	1737.297	.530	-906.926	625.573	1343.259
476	24.688	-33.997	1737.432	.418	-882.691	725.681	1308.783

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
477	25.064	-36.694	1736.830	.339	-940.096	735.776	1261.520
478	27.613	-36.550	1737.024	.192	-916.608	805.102	1236.483
479	27.287	-34.672	1737.267	.340	-878.305	796.449	1269.781
480	27.614	-34.239	1737.243	.425	-866.098	805.245	1272.582
481	29.082	-32.491	1736.245	.552	-815.068	843.932	1279.839
482	31.637	-31.060	1736.932	.445	-762.962	911.093	1266.779
483	34.207	-34.640	1735.897	.653	-816.024	975.906	1181.123
484	35.636	-38.673	1736.828	.463	-882.066	1011.931	1102.055
485	39.300	-40.009	1736.366	.430	-863.855	1099.791	1029.165
486	37.224	-32.579	1735.807	.470	-744.259	1050.036	1164.701
487	40.883	-36.060	1737.537	.256	-773.271	1137.239	1061.967
488	39.890	-32.473	1735.709	.401	-715.035	1113.141	1123.534
489	43.000	-32.717	1735.469	.198	-686.004	1183.597	1067.871
490	42.744	-30.533	1735.602	.544	-647.554	1177.997	1097.866
491	46.981	-45.283	1736.241	.577	-841.731	1269.404	833.448
492	46.968	-38.016	1737.703	.408	-730.322	1270.221	934.226
493	47.667	-32.723	1735.658	.187	-643.875	1262.478	1002.039
494	52.612	-33.877	1735.213	.682	-587.304	1378.698	874.774
495	53.487	-30.788	1736.582	.350	-528.896	1395.733	887.647
496	57.390	-31.013	1735.777	.486	-481.969	1462.151	801.712
497	56.967	-35.881	1735.713	.417	-554.565	1455.144	766.625
498	60.128	-33.028	1735.597	.468	-471.171	1505.000	724.754
499	58.700	-42.836	1737.476	.381	-613.713	1484.599	661.926
500	62.367	-40.119	1735.823	.531	-518.775	1537.831	615.653
501	.358	-40.107	1737.954	.322	-1119.605	10.860	1329.229
502	1.997	-42.103	1737.584	.142	-1164.276	60.547	1288.408
503	.213	-45.579	1737.626	.241	-1241.028	6.468	1216.204
504	1.912	-49.587	1735.788	.730	-1320.868	57.913	1124.684
505	4.368	-47.651	1736.543	.652	-1279.683	132.248	1166.406
506	4.646	-43.499	1737.224	.182	-1191.876	140.709	1256.017
507	4.903	-40.634	1737.673	.477	-1127.474	148.524	1313.868
508	7.153	-42.446	1737.551	.659	-1163.545	216.366	1272.176

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
509	9.410	-49.626	1737.458	.466	-1305.846	284.063	1110.330
510	10.541	-45.430	1736.840	.838	-1216.423	317.747	1198.317
511	10.028	-41.776	1737.026	.851	-1139.561	302.472	1275.606
512	12.605	-45.970	1737.013	.259	-1218.779	379.081	1178.172
513	14.903	-40.279	1737.265	.487	-1085.381	446.792	1280.786
514	16.024	-42.527	1737.584	.754	-1128.873	479.642	1230.768
515	16.345	-47.283	1736.186	.454	-1224.038	488.593	1130.199
516	19.293	-46.230	1735.914	.296	-1183.139	573.544	1133.413
517	19.769	-41.656	1737.235	.487	-1086.623	587.586	1221.465
518	23.718	-42.808	1737.373	.420	-1080.903	698.827	1166.942
519	25.901	-47.842	1737.222	.362	-1158.440	758.842	1048.864
520	27.973	-47.578	1736.125	.461	-1131.861	814.347	1034.339
521	27.733	-44.633	1736.853	.148	-1080.068	808.241	1094.011
522	29.871	-41.573	1737.006	.486	-999.504	865.113	1126.836
523	30.928	-41.120	1735.357	.622	-978.971	891.901	1121.424
524	31.743	-44.078	1736.725	.390	-1027.413	913.710	1061.024
525	30.582	-46.898	1736.011	.636	-1091.214	883.238	1021.213
526	29.259	-49.852	1736.523	.389	-1158.024	848.744	976.793
527	33.155	-48.708	1735.814	.427	-1091.885	949.329	958.963
528	35.059	-41.124	1735.452	.967	-934.295	996.879	1070.100
529	39.195	-45.548	1735.557	.360	-960.146	1096.808	941.960
530	40.827	-41.043	1736.880	.355	-862.986	1135.544	991.236
531	41.773	-48.263	1736.455	.475	-966.363	1156.798	862.111
532	44.027	-46.468	1736.112	.390	-904.997	1206.586	859.777
533	44.832	-42.113	1735.985	.572	-825.589	1223.922	913.269
534	50.216	-45.405	1734.957	.936	-790.550	1333.244	779.465
535	55.579	-45.184	1735.852	.412	-696.041	1431.923	691.596
536	57.518	-44.973	1736.134	.461	-658.970	1464.534	659.590
537	56.235	-43.700	1735.726	.323	-666.491	1442.954	697.437
538	61.028	-48.946	1736.451	.701	-634.259	1519.150	552.413
539	.206	-51.925	1736.736	.466	-1367.166	6.255	1071.013
540	1.304	-55.517	1736.195	.504	-1430.758	39.523	982.720

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
541	5.379	-57.509	1736.034	.636	-1457.856	162.743	928.429
542	7.978	-54.572	1736.556	.529	-1401.321	241.017	996.913
543	9.404	-50.622	1736.906	.221	-1324.535	283.807	1087.153
544	9.737	-54.895	1736.896	.388	-1400.485	293.755	984.458
545	12.142	-52.644	1737.191	.359	-1349.969	365.396	1030.486
546	13.288	-56.841	1736.447	.536	-1414.760	399.100	924.350
547	15.881	-55.609	1736.460	.524	-1378.240	475.165	943.379
548	17.389	-54.952	1735.542	.471	-1355.905	518.683	951.101
549	17.901	-51.271	1735.967	.617	-1288.682	533.591	1033.519
550	19.193	-57.080	1736.078	.192	-1376.318	570.739	891.053
551	22.573	-55.394	1735.878	.484	-1319.310	666.322	910.334
552	24.661	-57.798	1736.424	.428	-1335.299	724.521	840.960
553	26.121	-53.094	1737.007	.221	-1247.092	764.748	936.543
554	27.509	-52.804	1737.615	.660	-1227.650	802.569	931.698
555	26.644	-58.789	1735.376	.307	-1326.596	778.211	803.777
556	27.794	-59.886	1735.259	.239	-1327.874	809.151	770.159
557	28.985	-60.074	1735.069	.266	-1315.378	840.793	757.175
558	30.708	-56.541	1735.677	.681	-1245.001	886.349	822.758
559	30.893	-53.880	1736.302	.653	-1203.575	891.484	878.298
560	31.795	-51.669	1736.089	.551	-1157.503	914.708	915.151
561	38.641	-57.030	1735.734	.628	-1137.400	1083.870	737.779
562	40.897	-50.754	1735.528	.547	-1015.964	1136.243	829.955
563	43.579	-57.251	1735.037	.467	-1057.121	1196.048	679.939
564	46.789	-55.166	1735.236	.241	-975.192	1264.707	678.647
565	46.843	-52.084	1735.959	.632	-936.749	1266.359	729.649
566	52.775	-50.897	1735.934	.511	-814.929	1382.260	662.354
567	53.817	-53.349	1735.251	.464	-821.882	1400.586	611.525
568	57.270	-50.381	1735.364	.473	-722.753	1459.836	598.324
569	59.159	-57.504	1736.649	.924	-750.920	1491.069	478.311
570	3.049	-60.861	1735.882	.476	-1514.044	92.321	844.057
571	2.854	-68.216	1735.486	.883	-1609.552	86.399	643.263
572	8.110	-65.239	1736.907	.340	-1561.445	245.047	720.200

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
573	5.858	-69.208	1736.493	.928	1614.923	177.233	613.291
574	8.769	-62.567	1737.118	.358	-1523.755	264.825	790.959
575	11.697	-62.969	1735.850	.661	-1514.116	351.924	772.513
576	13.924	-61.883	1735.506	.704	-1485.706	417.634	793.876
577	12.663	-67.114	1735.886	.396	-1560.340	380.546	658.652
578	16.172	-61.363	1735.963	.310	-1463.324	483.502	799.048
579	22.039	-60.453	1735.051	.480	-1399.114	651.057	793.097
580	22.975	-62.031	1735.642	.747	-1411.332	677.460	749.428
581	25.033	-66.903	1734.927	.462	-1445.954	734.120	616.648
582	25.835	-62.141	1735.334	.457	-1380.871	756.216	729.875
583	32.095	-69.319	1736.165	.587	-1376.052	922.463	519.432
584	33.189	-65.365	1735.094	.323	-1319.878	949.794	605.277
585	33.256	-61.413	1735.483	.295	-1274.330	951.716	694.421
586	35.377	-61.929	1735.646	.610	-1248.698	1004.862	665.936
587	37.468	-60.609	1735.500	.470	-1200.162	1055.729	676.020
588	40.744	-64.314	1735.606	.430	-1185.016	1132.797	569.942
589	42.519	-64.673	1734.820	.740	-1155.749	1172.457	546.980
590	42.852	-67.549	1735.319	.231	-1175.756	1180.205	485.844
591	50.113	-61.948	1735.167	.484	-981.999	1331.410	523.288
592	50.664	-60.100	1735.947	.777	-953.888	1342.662	548.511
593	1.125	-75.007	1737.348	.847	-1677.883	34.098	449.359
594	2.974	-73.508	1737.454	.893	-1663.728	90.137	492.575
595	6.864	-74.301	1735.425	.497	-1658.715	207.412	466.202
596	11.189	-76.273	1735.488	.924	-1653.876	336.761	403.986
597	12.799	-70.694	1735.967	.378	-1597.637	384.586	559.668
598	15.097	-73.271	1735.867	.820	-1605.028	452.111	482.403
599	16.390	-72.357	1734.106	.634	-1585.386	489.322	504.218
600	22.415	-71.851	1735.290	.467	-1524.368	661.699	499.689
601	22.878	-75.356	1735.903	.980	-1547.392	674.871	404.331
602	25.356	-73.791	1735.961	.883	-1506.365	743.421	437.890
603	49.845	-72.383	1735.145	.745	-1066.457	1326.172	338.640
604	46.128	-68.191	1734.874	.817	-1116.300	1250.654	446.680

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
605	-.465	-.315	1737.917	.277	-9.561	-14.109	1737.834
606	-2.889	-.624	1737.608	.610	-18.891	-87.564	1735.297
607	-1.928	-2.473	1737.581	.173	-74.934	-58.471	1734.979
608	-4.983	-3.161	1739.654	.279	-95.566	-151.112	1730.441
609	-1.784	-8.071	1737.916	.587	-243.875	-54.117	1719.869
610	-5.576	-6.879	1738.619	.174	-207.269	-168.943	1717.933
611	-6.619	-9.778	1737.494	.409	-293.116	-200.265	1700.841
612	-2.712	-7.364	1737.515	.486	-222.452	-82.208	1721.254
613	-9.651	-7.338	1736.913	.562	-218.716	-291.177	1698.307
614	-9.567	-5.031	1737.553	.209	-150.267	-288.794	1706.783
615	-8.824	-3.979	1738.325	.394	-119.210	-266.654	1713.610
616	-8.500	-.803	1737.971	.421	-24.081	-256.890	1718.712
617	-12.329	-3.369	1736.820	.532	-99.724	-370.847	1693.833
618	-12.609	-7.485	1737.191	.340	-220.837	-379.220	1680.849
619	-12.208	-7.711	1737.127	.654	-227.796	-367.333	1682.494
620	-10.174	-9.454	1736.516	.419	-280.739	-306.743	1685.996
621	-15.100	-6.844	1737.265	.160	-199.874	-452.566	1665.330
622	-15.586	-.514	1739.260	.750	-15.034	-467.323	1675.234
623	-18.028	-1.475	1735.956	.653	-42.490	-537.249	1650.181
624	-17.876	-4.375	1737.332	.524	-126.132	-533.299	1648.637
625	-16.185	-7.657	1737.446	.272	-222.317	-484.292	1653.709
626	-19.741	-8.230	1736.961	.999	-234.029	-586.679	1618.045
627	-22.329	-8.549	1736.827	.422	-238.839	-659.878	1588.737
628	-23.084	-4.617	1738.097	.401	-128.707	-681.483	1593.737
629	-22.852	-1.535	1739.032	.578	-42.931	-675.347	1601.965
630	-24.642	-.872	1737.004	.483	-24.019	-724.249	1578.629
631	-26.113	-1.919	1737.853	.338	-52.258	-764.901	1559.592
632	-28.211	-6.220	1738.262	.458	-165.963	-821.708	1522.763
633	-29.059	-8.649	1737.337	.509	-228.367	-843.845	1501.371
634	-39.369	-6.149	1738.007	.961	-143.924	-1102.430	1335.891
635	-51.888	-9.115	1736.671	.864	-169.808	-1366.416	1058.348
636	-64.238	-.802	1737.660	.955	-10.570	-1564.949	755.170

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
637	-1.371	-13.199	1737.850	.238	-396.694	-41.569	1691.457
638	-3.423	-12.582	1737.427	.366	-377.785	-103.722	1692.682
639	-1.603	-14.086	1738.901	.326	-423.042	-48.655	1685.955
640	-2.188	-16.292	1737.727	.423	-487.120	-66.358	1666.735
641	-2.605	-18.605	1737.429	.386	-553.740	-78.979	1644.929
642	-4.796	-17.565	1737.965	.635	-522.664	-145.305	1651.129
643	-.532	-14.903	1736.811	.608	-446.666	-16.120	1678.315
644	-7.432	-19.057	1737.613	.543	-562.572	-224.765	1628.585
645	-6.842	-12.705	1736.632	.751	-379.213	-206.878	1682.048
646	-7.634	-14.721	1736.936	.353	-437.456	-230.745	1665.033
647	-9.500	-15.939	1737.365	.390	-470.572	-286.752	1647.656
648	-10.141	-18.245	1736.432	.461	-535.146	-305.742	1623.373
649	-11.118	-17.242	1737.109	.327	-505.230	-334.981	1627.906
650	-11.969	-14.590	1736.995	.291	-428.037	-360.238	1644.434
651	-9.994	-12.034	1737.057	.127	-356.665	-301.471	1673.103
652	-11.540	-11.533	1737.251	.408	-340.311	-347.536	1667.767
653	-14.509	-11.236	1736.110	.204	-327.500	-434.962	1648.524
654	-15.036	-14.667	1736.011	.341	-424.522	-450.360	1621.940
655	-14.551	-15.259	1737.601	.266	-442.648	-436.568	1622.569
656	-17.010	-17.857	1737.582	.309	-509.509	-508.325	1581.518
657	-19.189	-16.999	1737.039	.533	-479.608	-570.948	1568.853
658	-17.118	-12.447	1735.930	.261	-357.585	-510.954	1620.035
659	-18.209	-10.189	1736.130	.407	-291.723	-542.508	1623.186
660	-20.113	-13.529	1736.695	.165	-381.502	-597.212	1585.529
661	-22.255	-10.222	1736.546	.730	-285.225	-657.686	1581.673
662	-21.924	-12.457	1736.125	.667	-347.409	-648.215	1572.658
663	-22.250	-18.437	1736.358	.301	-508.261	-657.473	1524.578
664	-23.925	-16.350	1735.336	.458	-446.529	-703.742	1522.088
665	-24.904	-18.507	1736.241	.270	-499.885	-731.124	1493.354
666	-27.117	-17.486	1736.823	.371	-464.494	-791.671	1474.468
667	-26.489	-13.531	1736.817	.457	-363.717	-774.674	1511.332
668	-26.664	-10.138	1737.023	.680	-273.229	-779.514	1528.055

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
669	-28.418	-11.901	1738.129	.629	-315.236	-827.189	1495.820
670	-30.062	-17.000	1738.604	.367	-439.930	-870.918	1438.995
671	-30.576	-18.625	1738.220	.440	-477.942	-884.196	1418.159
672	-32.071	-15.999	1738.315	.217	-405.991	-922.999	1415.975
673	-32.435	-13.285	1738.959	.627	-337.271	-932.678	1428.404
674	-35.078	-11.410	1739.707	.387	-281.653	-999.792	1395.589
675	-34.959	-15.036	1739.127	.448	-369.773	-996.497	1376.527
676	-36.581	-19.984	1737.354	.421	-476.789	-1035.386	1311.124
677	-39.050	-18.070	1735.297	.445	-418.010	-1093.245	1281.147
678	-39.694	-17.543	1736.145	.627	-402.666	-1108.865	1273.765
679	-38.242	-14.552	1737.233	.782	-342.822	-1075.310	1320.667
680	-39.525	-11.193	1738.361	.438	-260.283	-1106.316	1315.376
681	-45.646	-11.951	1739.237	.533	-251.784	-1243.620	1189.520
682	-44.125	-17.949	1738.671	.824	-384.609	-1210.504	1187.322
683	-45.240	-15.880	1737.458	.978	-334.762	-1233.707	1176.716
684	-52.436	-10.048	1738.619	.471	-184.924	-1378.146	1043.701
685	-53.179	-15.358	1738.379	.327	-275.926	-1391.596	1004.633
686	-54.804	-10.405	1738.401	.562	-180.966	-1420.590	985.501
687	-57.949	-16.150	1735.270	.617	-256.143	-1470.767	884.530
688	-58.054	-18.058	1735.379	.359	-284.629	-1472.553	872.990
689	-62.287	-12.090	1737.590	.732	-169.241	-1538.267	790.132
690	-61.140	-5.015	1737.974	.575	-73.329	-1522.123	835.653
691	-.603	-20.836	1737.860	.593	-618.119	-18.286	1624.115
692	-2.344	-22.971	1738.018	.572	-677.728	-71.073	1598.855
693	-1.895	-26.402	1737.221	.121	-772.049	-57.438	1555.178
694	-2.476	-28.089	1737.403	.239	-817.284	-75.046	1531.334
695	-4.210	-24.669	1737.299	.612	-723.149	-127.528	1574.484
696	-4.007	-21.652	1737.114	.428	-639.364	-121.397	1610.602
697	-5.449	-20.913	1737.670	.261	-617.469	-164.997	1615.861
698	-9.754	-22.627	1736.917	.581	-658.596	-294.278	1580.042
699	-10.902	-21.500	1737.289	.256	-625.238	-328.583	1587.225
700	-7.384	-29.521	1735.691	.578	-848.144	-223.078	1497.835

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
701	-10.436	-28.176	1736.927	.552	-806.580	-314.626	1505.774
702	-12.395	-25.374	1737.410	.423	-727.156	-372.951	1533.213
703	-14.579	-23.514	1736.880	.286	-670.643	-437.208	1541.376
704	-14.123	-25.994	1736.290	.546	-737.980	-423.656	1513.474
705	-14.325	-21.395	1737.328	.628	-614.057	-429.865	1567.309
706	-16.491	-23.426	1737.011	.378	-662.171	-493.085	1528.268
707	-18.305	-21.797	1736.987	.545	-612.332	-545.533	1531.198
708	-20.119	-26.755	1737.408	.663	-734.406	-597.612	1456.740
709	-23.252	-28.394	1736.872	.652	-758.845	-685.678	1403.824
710	-26.647	-28.334	1738.057	.430	-737.292	-779.509	1367.337
711	-26.035	-26.095	1736.817	.481	-686.428	-762.316	1401.507
712	-21.709	-23.979	1736.335	.200	-655.608	-642.252	1473.957
713	-21.754	-21.665	1737.457	.304	-595.753	-643.943	1499.724
714	-28.743	-22.795	1736.545	.505	-589.902	-835.083	1403.652
715	-29.288	-25.296	1737.775	.645	-647.618	-850.120	1370.309
716	-29.272	-29.165	1736.947	.210	-738.386	-849.291	1323.055
717	-31.089	-29.241	1738.186	.365	-727.131	-897.532	1298.848
718	-31.009	-25.999	1737.356	.528	-652.735	-895.028	1338.382
719	-32.740	-22.432	1738.150	.523	-557.899	-940.027	1351.393
720	-33.548	-21.834	1738.905	.284	-539.000	-960.972	1345.289
721	-36.919	-26.638	1737.218	.250	-622.721	-1043.511	1241.462
722	-39.324	-27.190	1737.361	.342	-614.122	-1100.976	1195.462
723	-38.628	-24.591	1737.563	.408	-564.866	-1084.695	1234.296
724	-39.262	-20.400	1738.009	.560	-469.067	-1099.938	1261.263
725	-42.307	-20.383	1736.329	.619	-447.254	-1168.721	1203.701
726	-42.498	-23.053	1739.512	.677	-503.822	-1170.657	1183.904
727	-44.952	-26.061	1737.042	.440	-540.062	-1227.244	1104.318
728	-45.227	-28.617	1738.006	.600	-586.277	-1233.806	1074.554
729	-47.346	-26.560	1737.394	.477	-526.370	-1277.785	1052.966
730	-51.669	-29.582	1737.293	.591	-531.922	-1362.807	937.018
731	-49.030	-23.585	1735.459	.817	-455.277	-1310.358	1042.833
732	-55.422	-22.035	1737.157	.672	-369.875	-1430.289	913.882

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
733	-56.245	-27.309	1737.625	.974	-442.962	-1444.697	857.889
734	-60.394	-28.176	1734.900	.746	-404.706	-1508.397	755.531
735	-60.416	-23.378	1739.056	.515	-340.681	-1512.343	788.080
736	-62.527	-28.277	1738.021	.680	-379.850	-1542.018	706.124
737	-72.168	-30.188	1735.181	.732	-267.196	-1651.816	459.304
738	-1.824	-30.280	1738.143	.242	-875.970	-55.329	1500.252
739	-2.995	-30.593	1737.482	.154	-883.071	-90.789	1493.582
740	-.860	-33.880	1737.701	.344	-968.582	-26.083	1442.489
741	-2.681	-36.720	1736.918	.484	-1037.369	-81.252	1390.735
742	-4.653	-37.368	1736.863	.322	-1050.688	-140.894	1375.825
743	-7.513	-38.036	1737.624	.552	-1061.464	-227.202	1356.839
744	-7.354	-36.863	1736.697	.391	-1033.279	-222.283	1378.056
745	-6.351	-33.670	1736.820	.433	-956.998	-192.125	1436.588
746	-10.407	-34.427	1737.221	.249	-965.983	-313.812	1409.375
747	-13.270	-30.009	1736.955	.486	-845.518	-398.690	1463.953
748	-15.240	-32.394	1737.490	.383	-898.114	-456.723	1415.510
749	-13.329	-33.909	1737.440	.483	-943.172	-400.543	1403.099
750	-13.789	-35.566	1737.728	.642	-981.594	-414.190	1372.813
751	-12.117	-39.011	1737.460	.310	-1069.309	-364.705	1319.976
752	-18.031	-39.212	1737.197	.342	-1044.294	-537.713	1279.909
753	-18.078	-35.713	1736.598	.331	-963.659	-538.886	1340.424
754	-20.201	-31.761	1737.663	.350	-858.400	-600.050	1386.565
755	-21.597	-37.010	1736.713	.734	-972.019	-639.243	1289.464
756	-20.876	-38.416	1736.743	.297	-1008.309	-618.874	1271.449
757	-23.384	-38.817	1736.332	.452	-998.989	-689.146	1241.751
758	-26.498	-39.738	1736.114	.652	-993.267	-774.599	1194.783
759	-25.717	-36.133	1736.744	.287	-922.651	-753.605	1263.753
760	-23.792	-32.762	1736.827	.923	-860.007	-700.673	1336.417
761	-25.195	-30.327	1736.308	.235	-793.318	-739.139	1356.129
762	-30.085	-31.634	1737.870	.293	-788.712	-871.158	1280.316
763	-29.132	-35.706	1737.299	.200	-885.672	-845.744	1232.278
764	-31.046	-38.430	1738.594	.816	-925.835	-896.628	1166.874

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
765	-31.576	-35.231	1738.963	.284	-854.637	-910.583	1210.135
766	-36.626	-36.802	1737.442	.523	-835.300	-1036.540	1116.495
767	-35.291	-31.577	1737.513	.329	-742.634	-1003.810	1208.227
768	-39.111	-37.075	1737.523	.542	-812.760	-1096.080	1075.646
769	-37.506	-32.241	1738.710	.512	-735.824	-1058.616	1166.622
770	-43.180	-30.057	1737.521	.316	-634.587	-1188.979	1096.635
771	-41.503	-35.841	1739.392	.544	-762.763	-1152.621	1056.002
772	-43.279	-36.696	1737.218	.445	-755.772	-1190.953	1014.083
773	-44.409	-36.819	1736.492	.600	-743.405	-1215.151	993.057
774	-45.295	-32.860	1739.590	.404	-663.984	-1236.397	1027.921
775	-47.421	-33.544	1738.982	.865	-650.160	-1280.489	980.661
776	-49.464	-33.210	1737.550	.845	-618.510	-1320.539	944.828
777	-51.777	-37.262	1737.041	.303	-650.716	-1364.638	855.362
778	-53.319	-33.658	1737.841	.806	-575.349	-1393.709	864.083
779	-57.195	-33.054	1739.402	.988	-514.001	-1461.997	789.864
780	-58.671	-37.879	1735.453	.823	-554.039	-1482.415	712.236
781	-60.873	-36.107	1738.538	.545	-498.665	-1518.695	683.677
782	-64.538	-43.583	1738.328	.560	-515.207	-1569.491	541.335
783	-65.804	-35.070	1736.695	.491	-408.980	-1584.124	582.575
784	-65.707	-33.325	1736.977	.723	-392.581	-1583.178	597.088
785	-70.386	-39.265	1736.825	.685	-369.006	-1636.042	451.400
786	-2.309	-40.605	1736.798	.390	-1129.457	-69.973	1317.535
787	-4.710	-41.055	1737.993	.157	-1137.628	-142.714	1306.161
788	-3.094	-43.639	1736.935	.269	-1196.935	-93.759	1255.190
789	-1.277	-47.768	1736.379	.367	-1285.348	-38.699	1166.788
790	-6.644	-49.239	1736.508	.200	-1306.470	-200.925	1126.154
791	-6.876	-45.882	1736.393	.670	-1237.606	-207.886	1200.072
792	-7.865	-42.902	1736.575	.668	-1171.036	-237.633	1260.118
793	-11.247	-41.213	1736.344	.657	-1122.039	-338.664	1281.103
794	-9.205	-46.030	1737.206	.424	-1234.180	-277.891	1190.572
795	-12.948	-48.772	1736.339	.229	-1272.688	-389.052	1115.248
796	-14.824	-48.269	1736.866	.605	-1253.043	-444.381	1117.637

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
797	-14.309	-46.223	1737.072	.761	-1215.322	-429.315	1164.517
798	-16.718	-44.560	1737.435	.520	-1167.553	-499.799	1185.621
799	-14.998	-44.920	1737.621	.789	-1185.165	-449.666	1188.490
800	-19.171	-46.914	1738.315	.609	-1199.140	-570.851	1121.576
801	-19.751	-45.915	1737.178	.678	-1174.410	-587.055	1137.503
802	-20.370	-41.725	1735.452	.448	-1082.812	-604.083	1214.246
803	-22.469	-46.002	1737.348	.743	-1154.911	-663.992	1115.201
804	-23.625	-40.534	1736.427	.527	-1033.912	-605.876	1209.116
805	-24.629	-45.729	1736.299	.411	-1130.170	-723.593	1101.753
806	-26.830	-47.810	1737.651	.255	-1148.868	-784.278	1041.366
807	-29.227	-48.567	1737.963	.948	-1137.131	-848.584	1003.670
808	-29.224	-43.249	1736.324	.513	-1038.257	-847.728	1103.720
809	-32.234	-48.417	1737.513	.683	-1099.336	-926.760	975.461
810	-33.550	-45.660	1738.419	.422	-1036.181	-960.771	1012.595
811	-37.058	-40.904	1737.539	.781	-907.937	-1047.087	1047.997
812	-36.276	-43.512	1737.836	.874	-964.597	-1028.237	1016.047
813	-37.911	-49.247	1737.950	.194	-1038.726	-1067.849	895.107
814	-39.504	-46.752	1738.162	.454	-976.876	-1105.705	918.879
815	-41.228	-41.437	1738.154	.640	-865.137	-1145.537	980.032
816	-43.991	-46.446	1738.709	1.171	-906.568	-1207.609	861.928
817	-47.990	-46.769	1738.736	.690	-847.848	-1291.934	797.033
818	-46.981	-43.450	1738.289	.636	-815.586	-1270.909	860.963
819	-48.159	-41.136	1737.737	.344	-762.563	-1294.617	873.036
820	-51.152	-49.411	1736.439	.452	-827.132	-1352.352	708.674
821	-54.549	-48.720	1736.111	.562	-756.719	-1414.262	664.320
822	-53.529	-43.492	1736.605	.309	-710.469	-1396.495	748.888
823	-59.568	-42.013	1735.504	.591	-588.360	-1496.399	653.142
824	-64.998	-42.967	1738.489	.971	-500.808	-1575.574	537.677
825	-65.556	-59.190	1737.235	1.020	-617.431	-1581.514	368.207
826	-.322	-57.087	1737.116	.609	-1458.275	-9.759	943.881
827	-3.200	-57.914	1736.128	.619	-1468.642	-96.902	920.783
828	-2.306	-54.039	1736.334	.306	-1404.287	-69.872	1018.798

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
829	-5.589	-52.196	1736.247	.238	-1365.309	-169.105	1059.192
830	-5.112	-55.814	1736.182	.600	-1430.488	-154.701	971.647
831	-8.240	-59.061	1736.174	.839	-1473.776	-248.816	883.387
832	-10.363	-57.389	1735.949	.451	-1438.426	-312.282	920.287
833	-13.207	-57.376	1737.309	.732	-1424.309	-396.931	911.845
834	-12.712	-52.141	1737.061	.281	-1337.838	-382.243	1039.934
835	-17.218	-58.395	1736.339	.776	-1412.528	-513.985	869.168
836	-20.052	-58.278	1737.473	.388	-1388.330	-595.718	858.181
837	-19.040	-51.320	1736.590	.423	-1281.494	-566.540	1025.939
838	-21.675	-53.617	1737.724	.835	-1300.070	-641.804	957.908
839	-23.246	-55.090	1737.068	.664	-1308.842	-685.583	913.406
840	-25.677	-58.800	1741.106	.755	-1342.216	-754.419	812.872
841	-28.638	-58.435	1738.920	.673	-1300.376	-833.431	798.908
842	-30.001	-54.303	1737.854	.744	-1222.240	-868.965	878.160
843	-31.724	-51.552	1738.991	.308	-1158.441	-914.420	919.750
844	-35.527	-50.048	1738.419	.522	-1084.562	-1010.169	908.507
845	-33.892	-53.268	1738.922	.542	-1156.847	-969.687	863.286
846	-33.170	-59.620	1737.706	.466	-1254.826	-950.750	735.601
847	-38.613	-57.706	1737.747	.427	-1147.807	-1084.452	725.444
848	-40.239	-50.750	1738.569	.805	-1027.741	-1123.071	839.690
849	-42.479	-54.120	1736.243	.623	-1037.533	-1172.523	750.503
850	-44.487	-52.867	1736.790	.874	-987.809	-1217.056	747.960
851	-49.182	-55.296	1738.766	.674	-934.374	-1315.878	647.081
852	-49.976	-53.494	1738.782	.379	-898.828	-1331.511	665.243
853	-50.453	-50.642	1737.478	.453	-855.352	-1339.783	701.556
854	-53.167	-51.673	1736.140	.622	-816.479	-1389.586	645.442
855	-.725	-62.665	1736.366	.577	-1542.357	-21.983	797.258
856	-1.330	-69.231	1737.175	.680	-1623.855	-40.309	615.828
857	-2.631	-61.555	1735.951	.839	-1524.774	-79.690	825.976
858	-4.031	-62.051	1736.579	.526	-1530.236	-122.082	811.898
859	-7.340	-64.960	1736.207	.631	-1560.126	-221.829	728.842
860	-10.695	-68.059	1738.000	.784	-1584.108	-322.536	638.133

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
861	-12.699	-68.674	1737.469	.270	-1578.898	-381.962	616.428
862	-13.546	-60.062	1738.315	.759	-1464.461	-407.168	843.389
863	-16.849	-61.960	1737.464	.890	-1467.693	-503.605	78 .689
864	-17.878	-68.003	1736.266	.636	-1532.137	-533.020	618.921
865	-20.602	-62.282	1739.466	.543	-1441.378	-612.066	757.328
866	-21.123	-61.386	1738.745	.662	-1423.828	-626.596	776.739
867	-24.516	-63.686	1739.199	.571	-1418.422	-721.680	701.475
868	-26.056	-67.802	1737.297	.870	-1445.056	-763.104	589.647
869	-29.464	-66.241	1737.940	.533	-1384.929	-854.841	609.633
870	-28.717	-69.260	1736.581	.703	-1424.299	-834.394	539.325
871	-29.469	-60.320	1740.193	.271	-1316.284	-856.098	750.175
872	-32.492	-69.191	1737.038	.689	-1369.567	-933.097	520.497
873	-37.466	-66.233	1737.282	.882	-1261.964	-1056.769	555.729
874	-35.675	-61.116	1736.862	.494	-1235.392	-1012.927	681.525
875	-40.171	-64.598	1737.765	.790	-1199.490	-1120.977	569.613
876	-43.485	-62.324	1736.782	.818	-1115.952	-1195.200	585.287
877	-49.836	-67.835	1737.074	.727	-1037.573	-1327.478	422.694
878	-47.374	-61.277	1737.514	1.281	-1031.879	-1278.444	565.469
879	-44.403	-67.387	1737.245	.656	-1145.725	-1215.559	477.232
880	-1.240	-71.128	1736.485	.792	-1642.748	-37.592	561.554
881	-4.865	-71.467	1736.471	.962	-1640.483	-147.278	549.958
882	-7.735	-71.052	1734.984	.862	-1626.038	-233.526	558.242
883	-11.853	-70.471	1738.236	.337	-1603.312	-357.024	568.673
884	-14.992	-73.964	1737.842	.372	-1613.368	-449.567	463.711
885	-17.101	-71.854	1735.095	.262	-1575.902	-510.213	516.496
886	-20.501	-71.050	1738.030	.990	-1539.725	-608.690	528.666
887	-.205	2.793	1737.473	.474	84.670	-6.211	1735.397
888	-2.195	3.012	1738.392	.254	91.271	-66.576	1734.717
889	-2.085	7.406	1738.199	.375	223.896	-63.232	1722.558
890	-1.086	9.410	1737.401	.477	284.012	-32.934	1713.714
891	-6.825	9.012	1738.939	.373	270.463	-206.661	1705.301
892	-7.371	8.227	1739.303	.371	246.837	-223.142	1707.177

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
893	-4.999	7.411	1739.705	.386	223.532	-151.590	1718.612
894	-4.822	5.010	1737.033	.636	151.149	-146.022	1724.272
895	-4.165	2.491	1739.132	.651	144.129	-126.314	1732.899
896	-3.189	4.762	1738.751	.659	144.129	-96.717	1730.065
897	-6.937	2.173	1739.901	.748	65.486	-210.145	1725.921
898	-9.346	.722	1738.499	.478	21.625	-282.330	1715.284
899	-10.307	3.739	1736.991	.776	111.440	-310.777	1705.326
900	-10.927	9.202	1738.839	.627	273.017	-329.617	1685.342
901	-14.654	6.393	1738.431	.139	187.275	-439.783	1671.425
902	-14.868	3.107	1737.649	.231	91.041	-445.860	1677.005
903	-13.151	1.493	1738.182	.516	44.107	-395.462	1692.022
904	-16.501	6.771	1738.363	.426	196.530	-493.754	1655.141
905	-15.853	8.382	1738.814	.539	243.825	-474.986	1654.815
906	-16.997	7.670	1738.949	.297	221.966	-508.324	1648.114
907	-17.244	9.413	1738.095	.669	271.494	-515.245	1637.617
908	-18.017	.934	1739.086	.773	26.961	-537.908	1653.586
909	-21.172	3.147	1737.256	.516	88.932	-627.432	1617.552
910	-21.776	8.913	1737.026	.608	249.918	-644.392	1593.600
911	-24.235	8.749	1738.904	.349	241.198	-713.789	1567.199
912	-24.774	5.026	1737.245	.355	138.192	-727.967	1571.302
913	-22.833	.429	1738.657	.197	11.995	-674.677	1602.372
914	-24.768	.792	1738.746	.262	21.826	-728.438	1578.651
915	-27.075	3.230	1737.632	.213	87.166	-790.904	1544.745
916	-27.369	9.009	1738.947	.477	241.826	-799.439	1525.239
917	-30.381	2.352	1738.931	.521	61.578	-879.467	1498.874
918	-33.338	4.716	1737.894	.483	119.375	-955.100	1447.000
919	-32.707	9.570	1737.473	.681	243.070	-938.826	1441.643
920	-35.344	5.583	1736.982	.540	137.830	-1004.823	1410.120
921	-36.541	9.676	1737.376	.797	234.617	-1034.433	1376.000
922	-41.093	.359	1735.051	.525	8.198	-1140.411	1307.592
923	-43.824	1.902	1736.434	.739	41.582	-1202.391	1252.090
924	-43.750	9.668	1736.911	.853	210.710	-1201.087	1236.871

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
925	-45.963	3.143	1736.297	.581	66.176	-1248.207	1205.125
926	-46.661	.865	1736.928	.298	17.985	-1263.285	1191.934
927	-49.584	4.195	1738.034	.846	82.435	-1323.259	1123.811
928	-57.307	4.705	1737.740	.542	76.993	-1462.436	935.465
929	-58.598	1.242	1736.336	.397	19.605	-1482.015	904.494
930	-62.453	3.630	1737.838	.365	50.881	-1540.823	802.094
931	-68.413	2.598	1739.153	.854	29.006	-1617.168	639.200
932	-69.304	4.335	1738.508	1.115	46.439	-1626.323	612.636
933	-75.801	8.311	1740.302	.345	61.700	-1687.137	422.390
934	-3.963	10.403	1738.761	.453	313.205	-120.161	1706.093
935	-3.803	12.115	1739.159	.167	364.214	-115.339	1696.679
936	-1.394	14.523	1737.439	.433	435.553	-42.275	1681.428
937	-.174	15.412	1737.125	.384	461.659	-5.272	1674.648
938	-.781	15.434	1738.045	.157	462.515	-23.680	1675.207
939	-2.663	16.921	1739.242	.477	505.675	-80.814	1662.144
940	-5.315	15.714	1738.960	.528	468.951	-161.071	1666.770
941	-6.092	18.092	1739.651	.349	537.196	-184.613	1644.300
942	-8.164	12.512	1740.138	.828	373.170	-247.113	1681.594
943	-10.759	11.720	1738.438	.547	346.931	-324.520	1672.272
944	-12.765	12.997	1738.270	.427	381.289	-384.081	1651.873
945	-10.450	14.433	1739.393	.177	426.355	-315.493	1656.555
946	-10.224	15.711	1738.990	.428	463.423	-308.672	1647.436
947	-10.799	17.406	1737.813	.513	510.651	-325.611	1628.867
948	-13.652	19.799	1739.494	.425	572.545	-410.566	1590.429
949	-16.942	19.464	1739.191	.693	554.369	-506.807	1568.631
950	-13.759	15.819	1739.797	.409	460.666	-413.783	1625.873
951	-16.192	12.080	1738.876	.413	349.468	-484.886	1632.926
952	-15.293	14.532	1739.609	.376	421.055	-458.823	1624.326
953	-16.401	10.767	1738.715	.245	311.611	-490.928	1638.602
954	-16.734	10.151	1738.243	.532	293.371	-500.474	1638.581
955	-15.899	14.261	1738.492	.844	411.864	-476.258	1620.463
956	-16.599	15.629	1737.154	.366	448.487	-496.254	1603.214

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
957	-18.963	16.586	1739.001	.657	469.465	-565.096	1576.196
958	-20.512	12.969	1738.336	.218	365.386	-609.110	1586.596
959	-21.784	13.078	1736.306	.368	364.836	-644.360	1570.494
960	-20.779	10.066	1739.101	.190	284.187	-616.978	1600.952
961	-20.906	17.448	1740.107	.346	487.401	-620.944	1550.754
962	-24.334	17.288	1737.262	.397	470.405	-715.843	1511.412
963	-25.716	12.657	1739.164	.484	343.326	-754.638	1528.836
964	-27.833	11.610	1738.542	.490	309.392	-811.730	1505.954
965	-30.350	17.558	1737.025	.439	452.192	-877.676	1429.147
966	-29.083	10.870	1737.892	.536	286.414	-844.760	1491.515
967	-32.435	17.431	1736.994	.474	439.149	-931.610	1398.714
968	-33.660	17.254	1738.146	.305	429.120	-963.399	1381.618
969	-34.295	12.471	1735.232	.446	309.572	-977.727	1399.730
970	-37.446	10.942	1737.734	.451	261.867	-1056.557	1354.559
971	-36.904	13.305	1738.916	.868	319.996	-1044.179	1353.190
972	-36.644	18.379	1739.111	.224	439.965	-1037.965	1324.222
973	-37.865	16.961	1738.886	.393	400.477	-1067.345	1313.057
974	-40.421	11.732	1736.177	.592	268.756	-1125.733	1294.143
975	-43.244	16.869	1736.766	.717	367.116	-1189.858	1210.709
976	-43.276	18.262	1737.747	.356	396.468	-1191.253	1201.455
977	-44.647	16.037	1734.254	.652	340.864	-1218.719	1185.822
978	-46.945	17.350	1737.878	.820	353.812	-1269.872	1132.458
979	-51.630	13.829	1736.729	.549	257.689	-1361.620	1046.811
980	-54.477	13.961	1736.553	.462	243.437	-1413.348	979.185
981	-57.989	10.517	1736.138	.676	167.976	-1472.144	904.848
982	-59.242	18.757	1736.855	.530	285.621	-1492.541	841.074
983	-62.088	11.342	1737.172	.906	159.923	-1535.086	797.309
984	-68.055	13.347	1738.115	.885	149.952	-1612.173	632.023
985	-73.503	27.234	1738.945	.580	225.975	-1667.358	439.069
986	-.303	20.413	1737.953	.237	606.164	-9.192	1628.791
987	-4.020	20.156	1737.612	.471	597.265	-121.806	1627.185
988	-2.694	25.990	1735.970	.489	759.893	-81.599	1558.684

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
989	-2.598	29.197	1735.151	.871	845.546	-78.659	1513.147
990	-5.162	29.644	1735.020	.488	854.664	-156.097	1501.824
991	-6.497	20.840	1737.874	.467	614.283	-196.645	1613.751
992	-8.282	23.272	1735.794	.276	678.664	-250.030	1577.936
993	-11.111	21.072	1737.982	.506	613.168	-334.931	1591.361
994	-10.567	25.263	1734.930	.329	727.878	-318.172	1542.382
995	-10.412	28.826	1735.299	.340	822.907	-313.611	1495.237
996	-14.423	30.049	1735.127	.113	841.456	-432.179	1454.592
997	-14.238	24.896	1738.225	.296	709.270	-427.517	1528.264
998	-15.875	25.339	1738.021	.459	715.449	-475.432	1510.898
999	-15.626	26.628	1738.760	.496	750.508	-468.355	1496.886
1000	-17.052	26.183	1738.069	.533	733.203	-509.658	1491.156
1001	-19.908	19.880	1740.358	.428	556.434	-592.607	1538.845
1002	-19.920	26.522	1737.467	.181	729.418	-591.966	1461.614
1003	-21.980	28.260	1736.604	.513	762.471	-649.995	1418.427
1004	-23.016	28.011	1737.714	.427	751.130	-679.420	1412.034
1005	-21.854	25.735	1739.778	.487	701.131	-647.629	1454.585
1006	-22.483	22.143	1738.112	.432	605.337	-664.655	1487.560
1007	-23.733	21.141	1740.835	.593	574.769	-700.647	1486.352
1008	-25.523	25.524	1738.804	.596	676.106	-749.207	1415.983
1009	-25.690	29.725	1737.505	.330	776.368	-753.218	1359.720
1010	-28.723	20.748	1739.571	.393	540.433	-835.998	1426.585
1011	-30.262	21.574	1740.766	.787	552.854	-877.275	1398.216
1012	-31.998	21.639	1738.795	.168	543.775	-921.374	1370.688
1013	-31.651	26.507	1737.589	.277	660.165	-911.782	1323.650
1014	-33.239	27.308	1737.091	.322	666.555	-952.161	1290.960
1015	-34.700	22.995	1737.764	.297	558.119	-989.267	1315.171
1016	-33.347	22.658	1740.893	.470	560.233	-956.989	1342.021
1017	-33.804	20.118	1738.243	.450	496.808	-967.074	1356.259
1018	-38.326	20.459	1736.512	.640	476.170	-1076.866	1276.360
1019	-37.534	23.161	1737.775	.467	542.015	-1058.696	1266.983
1020	-37.861	26.487	1737.177	.714	611.695	-1066.186	1227.541

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
1021	-41.755	25.600	1737.339	.448	559.998	-1156.984	1168.820
1022	-47.092	27.920	1736.584	.375	553.597	-1271.954	1044.695
1023	-46.654	21.648	1736.858	.858	439.802	-1263.080	1108.096
1024	-48.174	22.523	1736.672	.323	443.617	-1294.128	1069.798
1025	-51.307	23.284	1735.245	.703	428.805	-1354.369	996.435
1026	-52.762	23.745	1736.048	.839	423.016	-1382.121	961.593
1027	-55.508	26.988	1736.758	.458	446.325	-1431.436	876.419
1028	-57.830	21.535	1736.567	.801	339.397	-1469.955	860.060
1029	-59.070	25.578	1736.814	.764	385.410	1489.828	805.227
1030	-59.842	27.495	1736.137	.485	402.684	-1501.133	773.703
1031	-63.494	22.743	1737.290	.373	299.750	-1554.675	715.060
1032	-.750	32.189	1736.808	.402	925.134	-22.721	1469.733
1033	-.992	37.480	1738.619	.900	1057.773	-30.112	1379.494
1034	-2.418	36.958	1737.259	.284	1043.557	-73.292	1386.970
1035	-3.684	39.288	1735.961	.566	1096.983	-111.540	1340.800
1036	-4.959	39.306	1735.862	.601	1095.496	-150.054	1338.129
1037	-6.759	37.554	1735.989	.182	1050.740	-204.301	1366.699
1038	-4.249	34.086	1736.925	.440	970.765	-128.681	1434.561
1039	-7.919	31.558	1735.203	.765	899.488	-239.071	1464.477
1040	-8.033	33.199	1736.159	.321	941.308	-242.617	1438.514
1041	-9.466	36.099	1735.838	.824	1008.796	-285.470	1383.463
1042	-10.575	36.388	1734.590	.500	1011.573	-318.344	1372.653
1043	-11.159	39.165	.735.500	.395	1075.336	-335.863	1320.154
1044	-12.218	35.827	1734.322	.462	992.185	-367.034	1374.309
1045	-10.787	33.732	1735.290	.209	946.599	-324.765	1417.642
1046	-14.037	34.431	1736.479	.552	952.516	-421.178	1389.490
1047	-13.900	35.367	1735.351	.302	975.028	-416.868	1373.675
1048	-17.931	35.022	1733.719	.318	946.639	-533.774	1350.829
1049	-18.480	32.234	1735.353	.436	877.876	-550.072	1392.194
1050	-20.411	34.010	1735.373	.402	909.717	-605.216	1348.201
1051	-22.944	38.085	1738.907	.464	987.751	-677.893	1260.400
1052	-25.983	36.548	1737.353	.234	930.005	-761.138	1254.653

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
1053	-26.111	33.771	1737.423	.675	867.210	-764.664	1296.870
1054	-29.707	31.531	1736.131	.253	788.599	-860.360	1285.319
1055	-30.469	35.918	1738.248	.737	878.882	-881.424	1213.327
1056	-30.914	39.648	1736.846	.453	950.794	-892.303	1147.353
1057	-31.213	38.075	1740.167	.451	917.808	-901.784	1171.578
1058	-33.023	37.805	1738.712	.354	893.607	-947.557	1151.834
1059	-34.580	38.194	1737.945	.403	884.771	-986.370	1124.592
1060	-35.744	32.473	1738.622	.533	757.645	-1015.636	1190.489
1061	-37.343	35.799	1737.671	.792	808.080	-1054.047	1120.487
1062	-41.466	30.721	1736.127	.653	664.613	-1149.629	1118.382
1063	-38.415	36.233	1737.887	.534	804.854	-1079.837	1098.368
1064	-42.729	38.968	1735.831	.507	801.885	-1177.812	991.386
1065	-45.034	32.252	1735.503	.401	654.480	-1227.917	1037.230
1066	-46.463	35.355	1736.627	.513	692.195	-1258.922	975.631
1067	-51.242	36.685	1736.498	.338	649.454	-1354.121	871.775
1068	-50.339	30.954	1733.877	.802	569.207	-1334.789	949.036
1069	-52.053	30.637	1736.838	.484	544.270	-1369.630	918.961
1070	-57.390	37.607	1736.848	.934	571.192	-1463.048	741.532
1071	-59.042	31.052	1736.107	.426	460.666	-1488.789	765.089
1072	-61.440	33.979	1737.919	.517	464.356	-1526.444	688.987
1073	-.752	43.677	1736.144	.176	1198.861	-22.787	1255.552
1074	-3.569	46.340	1735.843	.408	1253.362	-108.050	1196.060
1075	-6.149	49.585	1735.237	.546	1313.562	-185.864	1118.507
1076	-3.821	42.671	1735.440	.233	1173.651	-115.648	1273.154
1077	-9.001	39.964	1736.256	.752	1101.476	-271.641	1314.361
1078	-7.936	43.487	1736.097	.584	1183.324	-239.701	1247.525
1079	-10.484	47.898	1736.222	.673	1266.696	-315.917	1144.615
1080	-11.777	45.566	1737.063	.336	1214.247	-354.540	1190.502
1081	-12.456	48.243	1736.237	.658	1264.710	-374.483	1129.065
1082	-13.527	47.740	1736.917	.242	1249.824	-406.268	1135.678
1083	-15.446	49.355	1737.299	.695	1270.575	-462.709	1090.756
1084	-15.805	46.504	1734.466	.251	1210.651	-472.413	1148.705

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
1085	-14.868	40.414	1734.696	.359	1086.962	-445.113	1276.542
1086	-17.198	40.187	1734.574	.345	1069.234	-512.881	1265.873
1087	-18.915	48.655	1736.973	.537	1233.612	-563.056	1085.470
1088	-22.288	44.528	1737.084	.169	1127.133	-658.819	1145.858
1089	-24.698	41.579	1737.988	.917	1047.916	-726.187	1181.153
1090	-26.176	47.955	1735.633	.218	1156.732	-765.648	1043.157
1091	-28.872	49.675	1736.781	.579	1159.514	-838.602	984.216
1092	-28.861	42.412	1737.670	.275	1026.414	-838.741	1123.604
1093	-31.750	49.402	1736.475	.694	1121.187	-913.755	960.902
1094	-33.094	42.552	1735.777	.588	983.419	-947.756	1071.245
1095	-35.401	48.514	1736.904	.629	1060.581	-1006.188	937.864
1096	-38.908	40.499	1736.267	.426	877.434	-1090.502	1027.393
1097	-44.183	49.130	1735.911	.545	941.352	-1209.842	814.570
1098	-44.271	43.313	1736.418	.329	852.917	-1212.119	904.682
1099	-50.334	46.457	1736.024	.277	803.230	-1336.360	763.375
1100	-50.246	48.298	1733.879	.571	827.855	-1332.992	737.648
1101	-54.870	46.365	1737.867	.931	723.772	-1421.304	690.094
1102	-56.043	40.596	1736.018	.291	631.006	-1439.949	736.299
1103	-64.346	48.616	1738.106	.250	564.589	-1566.772	497.470
1104	-1.244	55.796	1734.553	.694	1434.211	-37.658	974.829
1105	-.821	58.444	1734.583	.329	1477.934	-24.845	907.673
1106	-2.121	59.574	1733.389	.608	1493.643	-64.169	877.239
1107	-6.644	58.398	1734.374	.585	1467.254	-200.667	902.746
1108	-5.864	54.027	1735.548	.375	1397.218	-177.308	1014.135
1109	-5.385	52.925	1734.870	.525	1378.050	-162.811	1041.271
1110	-8.804	51.406	1735.074	.396	1340.128	-265.562	1069.586
1111	-10.417	55.860	1734.835	.647	1412.199	-313.679	957.575
1112	-15.272	53.374	1736.361	.465	1344.306	-457.352	999.310
1113	-15.884	55.354	1735.651	.611	1373.358	-475.038	949.059
1114	-17.581	55.415	1736.099	.329	1362.544	-524.398	939.424
1115	-22.654	51.071	1737.156	.542	1247.112	-669.094	1007.339
1116	-25.696	52.233	1736.900	.482	1237.251	-753.111	958.569

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
1117	-27.483	54.910	1737.978	.366	1261.610	-802.041	886.361
1118	-27.695	60.057	1736.560	.683	1332.368	-807.095	767.485
1119	-33.522	59.089	1737.864	.276	1243.032	-959.738	744.274
1120	-38.489	58.436	1736.808	.474	1158.337	-1080.917	711.601
1121	-37.697	53.141	1734.989	.503	1098.404	-1060.927	823.487
1122	-39.802	51.721	1735.835	.333	1046.854	-1111.181	826.133
1123	-49.230	62.216	1735.918	.576	1002.909	-1314.674	528.407
1124	-45.051	54.399	1733.776	.586	995.932	-1227.059	713.038
1125	-49.635	55.109	1736.802	.727	922.645	-1323.327	643.437
1126	-51.495	56.017	1735.312	.481	895.849	-1357.976	603.873
1127	-56.330	54.158	1736.286	.877	780.317	-1445.018	563.661
1128	-3.370	69.579	1736.518	.583	1624.573	-102.071	604.845
1129	-3.241	65.112	1736.912	.622	1573.086	-98.181	729.811
1130	-.044	62.820	1736.444	.801	1544.692	-1.326	793.196
1131	-5.609	60.197	1735.077	.621	1498.388	-169.591	858.232
1132	-7.019	69.976	1734.993	.317	1617.897	-212.026	589.622
1133	-7.729	63.778	1736.264	.569	1543.433	-233.504	760.199
1134	-7.107	68.316	1736.372	.896	1601.106	-214.838	636.624
1135	-9.778	66.457	1736.219	.761	1568.568	-294.861	683.450
1136	-13.470	62.887	1736.591	.708	1503.239	-404.507	769.670
1137	-15.257	61.586	1733.778	.752	1471.174	-456.238	795.913
1138	-13.077	66.016	1735.733	.744	1544.739	-392.723	687.255
1139	-15.812	66.610	1735.941	.419	1532.995	-473.020	663.074
1140	-18.484	62.102	1736.381	.883	1455.413	-550.495	770.550
1141	-20.764	63.636	1736.748	.723	1455.048	-615.700	721.139
1142	-25.114	68.918	1737.368	1.351	1467.821	-737.386	565.869
1143	-28.967	62.968	1734.881	.907	1352.033	-840.206	689.834
1144	-31.501	65.784	1737.064	.860	1350.755	-907.634	607.496
1145	-39.671	60.564	1737.164	.477	1164.512	-1108.977	657.128
1146	-33.681	62.510	1737.449	.490	1282.556	-963.521	667.386
1147	-47.226	65.267	1736.378	.767	1071.023	-1274.565	493.359
1148	-9.205	74.687	1738.261	.539	1654.955	-278.078	453.153

POINT NO.	LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	SPHERICAL STANDARD ERROR (KM)	X (KM)	Y (KM)	Z (KM)
1149	-9.172	70.784	1736.003	.316	1618.322	-276.718	564.064
1150	-14.685	74.917	1736.904	.657	1622.288	-440.313	437.196
1151	-16.069	73.634	1736.131	.563	1600.703	-480.557	470.066
1152	-20.633	75.030	1736.478	.365	1569.940	-611.892	419.798
1153	-27.120	73.684	1735.930	.411	1482.844	-791.338	434.065
1154	-27.453	70.495	1737.321	.474	1453.207	-800.938	514.753
1155	-45.214	71.305	1735.547	.665	1158.111	-1231.795	391.895
1156	-59.066	55.040	1735.306	.940	731.068	-1488.473	511.147

APPENDIX III

COORDINATES OF LIMB POSITIONS

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
55.238	-82.905	1736.550	3061	28533
57.378	-82.159	1734.393	3062	28533
59.613	-81.278	1736.642	3063	28533
61.956	-80.214	1736.603	3064	28533
64.651	-78.761	1737.432	3065	28533
67.625	-76.766	1737.434	3066	28533
69.902	-74.843	1737.715	3067	28533
72.146	-72.461	1738.474	3068	28533
74.504	-69.183	1737.861	3069	28533
76.781	-64.816	1738.144	3070	28533
79.423	-57.006	1737.950	3071	28533
81.419	-46.891	1737.161	3072	28533
83.108	-30.000	1737.303	3073	28533
83.876	-8.663	1736.959	3074	28533
83.685	13.908	1738.074	3075	28533
82.504	34.127	1738.462	3076	28533
80.489	48.689	1738.258	3077	28533
78.138	57.690	1737.639	3078	28533
75.529	63.782	1737.237	3079	28533
73.093	67.637	1738.422	3080	28533
70.159	70.976	1737.556	3081	28533
67.440	73.283	1737.817	3082	28533
64.485	75.238	1736.025	3083	28533
61.553	76.787	1736.066	3084	28533
58.439	78.134	1733.931	3085	28533
55.182	79.302	1735.359	3086	28533
52.480	80.131	1736.910	3087	28533
49.732	80.874	1735.760	3088	28533
47.277	81.468	1738.066	3089	28533
44.911	81.990	1738.018	3090	28533
42.498	82.478	1737.593	3091	28533
39.638	83.009	1738.032	3092	28533
36.984	83.463	1738.631	3093	28533
34.094	83.929	1736.966	3094	28533
31.334	84.330	1736.791	3095	28533
28.277	84.755	1736.097	3096	28533
25.499	85.119	1737.730	3097	28533
22.972	85.435	1737.537	3098	28533
20.601	85.721	1737.444	3099	28533
17.949	86.030	1735.536	3100	28533
15.350	86.323	1735.709	3101	28533
13.344	86.544	1735.071	3102	28533
11.901	86.700	1735.355	3103	28533
9.579	86.948	1736.738	3104	28533

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
7.197	87.198	1736.875	3105	28533
4.975	87.429	1734.204	3106	28533
3.636	87.567	1732.885	3107	28533
1.736	87.762	1732.890	3108	28533
-.482	87.989	1733.053	3109	28533
-2.824	88.228	1733.769	3110	28533
-4.713	88.421	1733.391	3111	28533
-7.016	88.657	1735.388	3112	28533
-9.507	88.915	1739.720	3113	28533
-12.716	89.253	1737.362	3114	28533
-15.675	89.571	1737.814	3115	28533
-19.040	89.944	1738.749	3116	28533
-22.056	90.290	1737.290	3117	28533
-25.459	90.699	1737.424	3118	28533
-29.089	91.160	1736.601	3119	28533
-32.776	91.662	1734.872	3120	28533
-35.376	92.040	1735.887	3121	28533
-38.473	92.524	1735.252	3122	28533
-41.231	92.990	1735.747	3123	28533
-44.137	93.526	1735.739	3124	28533
-46.939	94.095	1737.345	3125	28533
-50.074	94.806	1736.602	3126	28533
-52.922	95.538	1736.240	3127	28533
-56.092	96.475	1738.089	3128	28533
-58.502	97.298	1737.123	3129	28533
-61.048	98.302	1737.955	3130	28533
-62.553	98.977	1735.681	3131	28533
-64.613	100.019	1738.789	3132	28533
41.864	-81.171	1734.879	3061	33553
44.556	-80.735	1734.462	3062	33553
47.348	-80.237	1735.958	3063	33553
50.004	-79.710	1736.780	3064	33553
52.750	-79.099	1736.879	3065	33553
56.106	-78.236	1736.535	3066	33553
58.766	-77.435	1736.475	3067	33553
61.445	-76.489	1736.830	3068	33553
63.729	-75.542	1736.487	3069	33553
66.485	-74.166	1736.927	3070	33553
69.053	-72.568	1737.904	3071	33553
71.555	-70.588	1738.659	3072	33553
74.183	-67.828	1738.727	3073	33553
77.055	-63.477	1737.876	3074	33553
79.940	-56.352	1738.058	3075	33553
82.294	-45.705	1737.256	3076	33553
84.168	-27.284	1737.121	3077	33553

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
85.024	›.246	1738.081	3078	33553
84.324	3.078	1738.304	3079	33553
82.651	›1.772	1738.805	3080	33553
80.211	63.921	1737.810	3081	33553
77.926	70.202	1738.318	3082	33553
74.760	75.575	1738.363	3083	33553
71.534	79.090	1739.408	3084	33553
68.684	81.304	1738.432	3085	33553
66.059	82.882	1737.773	3086	33553
62.707	84.468	1737.366	3087	33553
59.956	85.519	1733.935	3088	33553
56.738	86.541	1733.850	3089	33553
53.639	87.368	1737.729	3090	33553
50.532	88.082	1736.241	3091	33553
47.066	88.773	1739.024	3092	33553
43.760	89.351	1738.821	3093	33553
40.258	89.897	1738.475	3094	33553
36.952	90.360	1738.418	3095	33553
33.719	90.775	1738.749	3096	33553
30.503	91.157	1738.173	3097	33553
27.051	91.538	1739.206	3098	33553
23.510	91.905	1738.904	3099	33553
20.451	92.205	1737.219	3100	33553
17.625	92.471	1737.421	3101	33553
15.036	92.707	1736.680	3102	33553
11.812	92.992	1735.600	3103	33553
8.700	93.260	1736.559	3104	33553
5.271	93.550	1736.683	3105	33553
1.952	93.826	1736.794	3106	33553
-.593	94.036	1738.321	3107	33553
-3.613	94.285	1740.360	3108	33553
-6.514	94.526	1737.786	3109	33553
-10.116	94.827	1738.512	3110	33553
-13.509	95.116	1739.785	3111	33553
-16.542	95.381	1738.431	3112	33553
-19.608	95.657	1737.776	3113	33553
-22.690	95.944	1738.173	3114	33553
-26.282	96.295	1737.228	3115	33553
-29.321	96.608	1737.340	3116	33553
-32.301	96.933	1737.044	3117	33553
-35.883	97.353	1735.240	3118	33553
-39.302	97.788	1736.313	3119	33553
-42.544	98.242	1738.968	3120	33553
-45.563	98.708	1737.676	3121	33553
-48.903	99.286	1737.110	3122	33553

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-53.730	100.270	1739.286	3123	33553
84.311	-101.118	1738.157	3061	29040
81.454	-98.728	1737.883	3062	29040
78.840	-97.609	1736.795	3063	29040
76.245	-96.911	1738.304	3064	29040
73.851	-96.462	1737.986	3065	29040
71.415	-96.120	1737.152	3066	29040
69.045	-95.859	1737.801	3067	29040
66.616	-95.644	1737.712	3068	29040
64.491	-95.487	1737.511	3069	29040
62.101	-95.335	1738.149	3070	29040
59.617	-95.200	1739.119	3071	29040
57.077	-95.081	1737.373	3072	29040
54.265	-94.966	1737.774	3073	29040
51.762	-94.875	1736.624	3074	29040
49.253	-94.792	1736.729	3075	29040
46.553	-94.711	1737.063	3076	29040
43.812	-94.636	1736.873	3077	29040
41.183	-94.569	1738.118	3078	29040
38.650	-94.509	1737.429	3079	29040
35.913	-94.448	1735.390	3080	29040
33.031	-94.387	1737.021	3081	29040
30.215	-94.331	1736.164	3082	29040
27.601	-94.281	1736.379	3083	29040
24.679	-94.227	1736.014	3084	29040
22.330	-94.185	1737.188	3085	29040
19.478	-94.135	1737.434	3086	29040
16.460	-94.083	1737.855	3087	29040
13.548	-94.034	1737.215	3088	29040
10.901	-93.989	1738.504	3089	29040
8.244	-93.945	1739.018	3090	29040
5.600	-93.901	1738.576	3091	29040
3.079	-93.859	1738.782	3092	29040
-.073	-93.805	1738.753	3093	29040
-2.494	-93.764	1740.841	3094	29040
-5.651	-93.709	1737.321	3095	29040
-8.413	-93.660	1738.648	3096	29040
-11.156	-93.609	1739.412	3097	29040
-14.160	-93.553	1735.047	3098	29040
-16.334	-93.511	1733.097	3099	29040
-18.420	-93.469	1732.394	3100	29040
-20.829	-93.418	1732.436	3101	29040
-23.407	-93.362	1733.714	3102	29040
-25.757	-93.308	1736.391	3103	29040
-28.736	-93.235	1737.626	3104	29040

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-31.070	-93.162	1737.917	3105	29040
-33.793	-93.100	1737.904	3106	29040
-36.328	-93.025	1741.334	3107	29040
-38.586	-92.954	1741.234	3108	29040
-41.137	-92.867	1738.434	3109	29040
-43.340	-92.786	1738.249	3110	29040
-45.829	-92.687	1737.415	3111	29040
-48.260	-92.580	1735.289	3112	29040
-50.576	-92.467	1734.799	3113	29040
-52.828	-92.345	1735.975	3114	29040
-55.201	-92.202	1737.184	3115	29040
-57.749	-92.026	1739.011	3116	29040
-59.928	-91.854	1740.189	3117	29040
-62.256	-91.642	1741.113	3118	29040
-64.365	-91.420	1740.118	3119	29040
-66.997	-91.088	1739.135	3120	29040
-69.230	-90.742	1741.904	3121	29040
-71.814	-90.242	1735.869	3122	29040
-73.679	-89.782	1738.626	3123	29040
-76.033	-89.031	1738.453	3124	29040
-78.642	-87.841	1736.064	3125	29040
-81.257	-85.936	1734.208	3126	29040
-84.120	-81.876	1740.451	3127	29040
-86.539	-73.008	1737.269	3128	29040
-88.696	-21.290	1737.954	3129	29040
-87.076	60.715	1741.467	3130	29040
-84.270	73.395	1737.220	3131	29040
-81.786	77.238	1739.040	3132	29040
-79.343	79.261	1739.483	3133	29040
62.472	-101.877	1736.843	3061	8778
59.818	-100.423	1737.379	3062	8778
56.588	-98.946	1735.510	3063	8778
53.553	-97.774	1737.932	3064	8778
50.498	-96.756	1737.260	3065	8778
47.528	-95.886	1737.646	3066	8778
44.630	-95.127	1737.523	3067	8778
41.457	-94.379	1738.095	3068	8778
38.546	-93.755	1738.103	3069	8778
35.909	-93.232	1736.201	3070	8778
33.523	-92.787	1738.395	3071	8778
30.641	-92.281	1737.332	3072	8778
27.808	-91.812	1736.561	3073	8778
24.870	-91.350	1736.639	3074	8778
21.577	-90.857	1737.280	3075	8778
18.814	-90.460	1738.677	3076	8778

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
16.067	-90.078	1737.130	3077	8778
13.530	-89.733	1737.818	3078	8778
10.444	-89.324	1737.526	3079	8778
7.601	-88.953	1738.163	3080	8778
4.132	-88.506	1737.202	3081	8778
1.236	-88.135	1736.728	3082	8778
-1.444	-87.792	1737.522	3083	8778
-4.275	-87.428	1737.492	3084	8778
-7.199	-87.049	1737.253	3085	8778
-10.289	-86.642	1739.219	3086	8778
-13.409	-86.222	1737.667	3087	8778
-16.659	-85.772	1736.248	3088	8778
-19.601	-85.350	1737.760	3089	8778
-22.063	-84.984	1736.970	3090	8778
-24.702	-84.577	1737.177	3091	8778
-27.732	-84.087	1738.220	3092	8778
-30.444	-83.624	1737.874	3093	8778
-32.953	-83.170	1739.235	3094	8778
-35.689	-82.645	1738.693	3095	8778
-38.790	-82.002	1739.688	3096	8778
-41.716	-81.340	1739.946	3097	8778
-44.635	-80.616	1739.253	3098	8778
-47.305	-79.883	1739.279	3099	8778
-50.131	-79.020	1740.284	3100	8778
-52.654	-78.156	1739.462	3101	8778
-55.338	-77.116	1738.813	3102	8778
-57.968	-75.945	1739.445	3103	8778
-60.552	-74.606	1741.557	3104	8778
-63.120	-73.035	1739.052	3105	8778
-65.657	-71.167	1736.417	3106	8778
-68.291	-68.768	1735.862	3107	8778
-70.758	-65.907	1738.489	3108	8778
-73.447	-61.752	1740.945	3109	8778
-76.068	-55.958	1740.351	3110	8778
-78.247	-48.704	1741.339	3111	8778
-80.231	-37.983	1736.333	3112	8778
-81.399	-27.175	1739.967	3113	8778
-82.289	-10.428	1740.028	3114	8778
-82.401	9.020	1740.036	3115	8778
-81.726	26.245	1741.032	3116	8778
-80.395	40.309	1739.320	3117	8778
-78.831	49.660	1740.671	3118	8778
-76.889	57.122	1739.821	3119	8778
-74.848	62.486	1740.636	3120	8778
-72.604	66.750	1739.979	3121	8778

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-69.682	70.787	1739.054	3122	8778
-66.839	73.703	1736.820	3123	8778
-64.264	75.783	1737.295	3124	8778
-61.928	77.344	1736.624	3125	8778
-59.648	78.644	1737.063	3126	8778
88.405	97.309	1737.684	3061	30131
85.660	95.737	1737.810	3062	30131
82.903	95.376	1738.360	3063	30131
80.592	95.235	1737.489	3064	30131
78.243	95.145	1736.659	3065	30131
75.948	95.084	1736.653	3066	30131
74.761	95.058	1738.293	3067	30131
72.166	95.014	1737.448	3068	30131
69.880	94.982	1737.454	3069	30131
66.993	94.949	1737.356	3070	30131
64.253	94.924	1736.628	3071	30131
61.388	94.900	1735.471	3072	30131
58.471	94.879	1736.147	3073	30131
56.063	94.863	1736.767	3074	30131
52.860	94.844	1733.755	3075	30131
50.078	94.827	1738.494	3076	30131
47.525	94.813	1738.454	3077	30131
44.586	94.798	1738.009	3078	30131
42.107	94.785	1738.364	3079	30131
39.639	94.773	1737.992	3080	30131
37.335	94.762	1737.920	3081	30131
34.736	94.750	1736.977	3082	30131
31.871	94.736	1736.629	3083	30131
29.437	94.725	1736.045	3084	30131
26.894	94.713	1734.862	3085	30131
23.738	94.698	1735.509	3086	30131
20.914	94.685	1736.621	3087	30131
18.946	94.675	1736.986	3088	30131
16.644	94.664	1736.089	3089	30131
13.933	94.651	1734.810	3090	30131
11.662	94.639	1734.389	3091	30131
6.555	94.612	1735.897	3092	30131
3.644	94.596	1738.441	3093	30131
1.116	94.582	1736.382	3094	30131
-1.630	94.565	1738.103	3095	30131
-5.620	94.541	1739.641	3096	30131
-8.514	94.522	1740.347	3097	30131
-12.287	94.496	1739.459	3098	30131
-15.631	94.471	1740.221	3099	30131
-18.061	94.452	1737.595	3100	30131

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-20.886	94.429	1737.859	3101	30131
-24.407	94.397	1739.285	3102	30131
-27.023	94.372	1736.693	3103	30131
-29.855	94.342	1736.624	3104	30131
-33.227	94.304	1734.683	3105	30131
-36.086	94.268	1734.776	3106	30131
-39.038	94.227	1734.733	3107	30131
-42.086	94.180	1736.278	3108	30131
-45.071	94.129	1735.756	3109	30131
-48.456	94.062	1737.548	3110	30131
-51.606	93.990	1736.675	3111	30131
-54.782	93.905	1736.588	3112	30131
-58.248	93.794	1736.178	3113	30131
-61.246	93.677	1738.401	3114	30131
-64.326	93.530	1735.826	3115	30131
-67.214	93.356	1737.317	3116	30131
-69.936	93.147	1738.321	3117	30131
-73.138	92.818	1736.170	3118	30131
-75.972	92.399	1740.098	3119	30131
-79.256	91.642	1741.010	3120	30131
-83.268	89.721	1740.574	3121	30131
-84.548	85.517	1736.274	3122	30131
-86.165	85.821	1739.311	3123	30131
-89.046	55.754	1737.663	3124	30131
-88.111	-66.604	1736.697	3125	30131
-85.135	-78.066	1736.036	3126	30131
-83.850	-79.550	1740.395	3127	30131
-80.670	-81.476	1735.223	3128	30131
-77.535	-82.408	1737.251	3129	30131
-74.432	-82.963	1738.413	3130	30131
-71.237	-83.343	1739.401	3131	30131
-68.331	-83.592	1741.021	3132	30131
-65.594	-83.774	1741.483	3133	30131
-63.133	-83.907	1740.993	3134	30131
-60.499	-84.025	1740.601	3135	30131
-57.821	-84.126	1739.020	3136	30131
-55.127	-84.212	1737.545	3137	30131
-52.412	-84.286	1738.654	3138	30131
-50.233	-84.339	1739.536	3139	30131
-45.511	-84.437	1740.219	3140	30131
-43.075	-84.480	1739.632	3141	30131
-40.842	-84.516	1741.774	3142	30131
-38.113	-84.556	1742.055	3143	30131
-35.816	-84.588	1739.423	3144	30131
-33.750	-84.614	1739.428	3145	30131

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-31.152	-84.645	1737.536	3146	30131
-28.993	-84.668	1737.574	3147	30131
-27.137	-84.687	1738.966	3148	30131
-24.953	-84.709	1737.223	3149	30131
-22.426	-84.732	1738.715	3150	30131
-20.383	-84.750	1739.221	3151	30131
-18.036	-84.769	1739.208	3152	30131
-15.469	-84.789	1740.641	3153	30131
-13.126	-84.807	1738.223	3154	30131
-11.286	-84.820	1739.573	3155	30131
-9.726	-84.831	1737.540	3156	30131
-7.394	-84.846	1739.215	3157	30131
-5.121	-84.861	1739.086	3158	30131
-3.131	-84.873	1738.107	3159	30131
-.460	-84.890	1737.794	3160	30131
1.637	-84.902	1737.552	3161	30131
3.284	-84.911	1738.131	3162	30131
5.546	-84.923	1738.290	3163	30131
6.926	-84.931	1737.000	3164	30131
8.693	-84.941	1736.717	3165	30131
11.016	-84.953	1737.025	3166	30131
13.524	-84.965	1738.031	3167	30131
15.764	-84.976	1738.203	3168	30131
18.117	-84.988	1737.373	3169	30131
20.244	-84.998	1737.750	3170	30131
22.819	-85.011	1736.910	3171	30131
25.355	-85.023	1737.405	3172	30131
28.202	-85.036	1737.295	3173	30131
30.842	-85.049	1736.807	3174	30131
33.294	-85.060	1735.912	3175	30131
36.363	-85.075	1735.705	3176	30131
38.448	-85.085	1735.514	3177	30131
40.540	-85.095	1735.786	3178	30131
43.040	-85.107	1736.246	3179	30131
45.903	-85.122	1735.986	3180	30131
48.603	-85.136	1736.409	3181	30131
51.049	-85.150	1737.516	3182	30131
53.368	-85.163	1737.099	3183	30131
56.335	-85.181	1737.629	3184	30131
59.052	-85.200	1737.161	3185	30131
61.243	-85.215	1738.217	3186	30131
63.728	-85.236	1737.594	3187	30131
66.446	-85.261	1738.057	3188	30131
68.965	-85.287	1738.860	3189	30131
71.026	-85.314	1738.354	3190	30131

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS. VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
73.566	-85.353	1738.992	3191	30131
75.905	-85.398	1739.607	3192	30131
78.301	-85.463	1738.611	3193	30131
80.455	-85.544	1739.428	3194	30131
82.903	-85.692	1739.540	3195	30131
84.639	-85.876	1739.752	3196	30131
86.573	-86.296	1738.815	3197	30131
88.803	-88.444	1738.282	3198	30131
89.384	101.244	1738.058	3199	30131
41.500	-99.482	1737.310	3061	5402
39.031	-98.970	1738.245	3062	5402
36.279	-98.440	1736.556	3063	5402
33.919	-98.014	1736.401	3064	5402
31.493	-97.599	1736.439	3065	5402
28.927	-97.183	1737.334	3066	5402
26.203	-96.763	1737.512	3067	5402
23.431	-96.355	1736.619	3068	5402
20.711	-95.970	1736.703	3069	5402
17.945	-95.592	1737.860	3070	5402
14.988	-95.200	1737.589	3071	5402
12.275	-94.850	1737.164	3072	5402
9.580	-94.508	1737.938	3073	5402
6.475	-94.120	1739.611	3074	5402
3.316	-93.730	1738.375	3075	5402
.662	-93.403	1737.829	3076	5402
-1.839	-93.095	1738.276	3077	5402
-4.839	-92.724	1738.510	3078	5402
-7.222	-92.427	1736.186	3079	5402
-9.434	-92.147	1739.364	3080	5402
-12.615	-91.738	1736.083	3081	5402
-15.517	-91.356	1733.782	3082	5402
-18.533	-90.945	1733.204	3083	5402
-21.501	-90.526	1733.574	3084	5402
-23.930	-90.169	1735.863	3085	5402
-26.736	-89.739	1737.000	3086	5402
-29.870	-89.231	1738.614	3087	5402
-32.549	-88.771	1736.646	3088	5402
-35.757	-88.180	1739.357	3089	5402
-38.785	-87.575	1740.453	3090	5402
-41.447	-86.999	1738.815	3091	5402
-44.570	-86.257	1738.480	3092	5402
-47.261	-85.549	1737.780	3093	5402
-50.284	-84.658	1738.132	3094	5402
-52.478	-83.936	1737.945	3095	5402
-55.002	-83.008	1737.713	3096	5402

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-57.317	-82.043	1738.867	3097	5402
-59.824	-80.845	1739.845	3098	5402
-62.340	-79.439	1740.170	3099	5402
-64.953	-77.691	1740.281	3100	5402
-67.822	-75.307	1738.395	3101	5402
-70.394	-72.566	1738.945	3102	5402
-72.887	-69.083	1740.471	3103	5402
-75.689	-63.568	1739.289	3104	5402
-76.811	-60.597	1739.609	3105	5402
-77.277	-59.180	1735.414	3106	5402
-79.202	-51.617	1739.649	3107	5402
-80.847	-41.271	1736.512	3108	5402
-81.993	-28.577	1741.065	3109	5402
-82.718	-7.573	1738.867	3110	5402
-82.407	13.426	1739.870	3111	5402
-81.404	28.926	1739.643	3112	5402
-79.876	40.853	1739.057	3113	5402
-77.944	49.755	1739.911	3114	5402
-76.035	55.558	1739.642	3115	5402
-73.864	60.249	1739.340	3116	5402
-72.196	63.000	1739.225	3117	5402
-70.257	65.578	1738.850	3118	5402
-67.923	68.059	1737.762	3119	5402
-65.414	70.194	1737.457	3120	5402
-63.061	71.838	1736.769	3121	5402
-61.053	73.036	1737.181	3122	5402
-58.676	74.264	1736.705	3123	5402
-56.411	75.283	1736.567	3124	5402
-54.411	76.084	1735.304	3125	5402
-51.711	77.045	1736.120	3126	5402
-49.295	77.810	1737.584	3127	5402
-47.042	78.457	1736.258	3128	5402
-44.650	79.085	1735.781	3129	5402
-42.537	79.597	1735.698	3130	5402
-40.384	80.083	1735.785	3131	5402
-38.301	80.524	1735.762	3132	5402
-36.087	80.965	1736.061	3133	5402
-33.979	81.361	1736.711	3134	5402
-31.944	81.725	1735.924	3135	5402
-29.709	82.106	1738.514	3136	5402
55.896	88.781	1736.464	3061	4027
57.934	88.271	1735.270	3062	4027
59.635	87.798	1734.075	3063	4027
61.758	87.134	1734.586	3064	4027
63.450	86.532	1738.274	3065	4027

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
65.246	85.811	1737.671	3066	4027
68.046	84.459	1739.224	3067	4027
70.783	82.768	1738.132	3068	4027
72.206	81.686	1738.748	3069	4027
74.221	79.819	1738.702	3070	4027
75.653	78.168	1737.599	3071	4027
77.096	76.121	1737.611	3072	4027
78.648	73.306	1737.396	3073	4027
80.518	68.581	1737.660	3074	4027
82.265	61.777	1737.258	3075	4027
83.736	52.241	1737.383	3076	4027
84.983	36.772	1738.391	3077	4027
85.682	13.069	1737.362	3078	4027
85.496	-13.087	1737.068	3079	4027
84.433	-34.671	1737.011	3080	4027
83.004	-47.235	1737.776	3081	4027
81.037	-56.473	1736.991	3082	4027
78.889	-62.388	1738.006	3083	4027
76.712	-66.306	1738.506	3084	4027
74.433	-69.190	1737.451	3085	4027
72.322	-71.186	1738.484	3086	4027
70.182	-72.775	1737.594	3087	4027
68.121	-74.014	1737.727	3088	4027
65.656	-75.227	1736.257	3089	4027
63.667	-76.046	1736.911	3090	4027
61.501	-76.814	1736.759	3091	4027
59.689	-77.377	1736.530	3092	4027
57.640	-77.944	1736.520	3093	4027
55.602	-78.446	1736.846	3094	4027
53.732	-78.861	1737.923	3095	4027
51.780	-79.258	1736.124	3096	4027
50.047	-79.581	1736.994	3097	4027
47.847	-79.958	1736.260	3098	4027
46.060	-80.241	1736.170	3099	4027
41.960	-80.825	1735.601	3100	4027
39.819	-81.100	1736.365	3101	4027
37.548	-81.373	1735.674	3102	4027
35.434	-81.612	1735.652	3103	4027
33.564	-81.813	1735.923	3104	4027
29.444	-82.225	1735.193	3105	4027
27.005	-82.453	1735.822	3106	4027
25.186	-82.616	1736.548	3107	4027
23.104	-82.796	1736.208	3108	4027
21.192	-82.956	1736.955	3109	4027
19.545	-83.091	1737.236	3110	4027

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
17.503	-83.254	1737.113	3111	4027
15.643	-83.398	1737.965	3112	4027
13.602	-83.554	1737.466	3113	4027
11.781	-83.690	1736.971	3114	4027
9.874	-83.831	1736.201	3115	4027
7.791	-83.982	1736.318	3116	4027
5.685	-84.133	1737.975	3117	4027
3.815	-84.266	1737.715	3118	4027
1.801	-84.408	1737.234	3119	4027
-.344	-84.559	1737.716	3120	4027
-2.329	-84.698	1737.826	3121	4027
-4.203	-84.829	1738.975	3122	4027
-6.449	-84.987	1739.662	3123	4027
-8.786	-85.153	1737.545	3124	4027
-10.675	-85.288	1737.974	3125	4027
-14.098	-85.536	1739.840	3126	4027
-16.430	-85.709	1738.122	3127	4027
-18.489	-85.865	1737.342	3128	4027
-19.737	-85.961	1739.425	3129	4027
-21.821	-86.125	1737.816	3130	4027
-23.558	-86.264	1738.081	3131	4027
-24.258	-86.321	1738.871	3132	4027
-27.474	-86.592	1739.565	3133	4027
-29.309	-86.754	1738.626	3134	4027
-31.207	-86.927	1737.928	3135	4027
-33.455	-87.140	1739.156	3136	4027
-35.666	-87.361	1739.672	3137	4027
-37.811	-87.586	1740.111	3138	4027
-40.230	-87.856	1739.970	3139	4027
-42.171	-88.087	1738.373	3140	4027
-43.763	-88.287	1738.689	3141	4027
-45.928	-88.576	1738.986	3142	4027
-48.009	-88.876	1737.345	3143	4027
-49.175	-89.054	1737.637	3144	4027
-50.792	-89.316	1737.044	3145	4027
-52.868	-89.679	1736.802	3146	4027
-55.082	-90.107	1737.624	3147	4027
-58.138	-90.780	1738.979	3148	4027
-61.303	-91.611	1741.117	3149	4027
-64.487	-92.637	1740.462	3150	4027
-70.146	-95.216	1741.991	3151	4027
48.162	93.335	1739.564	3061	29331
45.757	92.845	1738.096	3062	29331
44.179	92.545	1737.673	3063	29331
42.048	92.165	1738.038	3064	29331

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
40.246	91.862	1737.545	3065	29331
38.423	91.572	1737.882	3066	29331
36.379	91.264	1736.681	3067	29331
34.362	90.974	1737.169	3068	29331
32.167	90.674	1736.939	3069	29331
30.269	90.425	1736.947	3070	29331
28.120	90.155	1737.799	3071	29331
26.174	89.919	1736.992	3072	29331
24.273	89.696	1737.525	3073	29331
22.105	89.449	1736.371	3074	29331
19.615	89.174	1735.498	3075	29331
17.613	88.959	1734.984	3076	29331
15.581	88.745	1735.663	3077	29331
13.600	88.540	1734.988	3078	29331
11.364	88.312	1734.763	3079	29331
9.055	88.080	1735.883	3080	29331
6.603	87.837	1735.903	3081	29331
4.821	87.661	1733.825	3082	29331
2.351	87.419	1732.696	3083	29331
-.016	87.187	1732.745	3084	29331
-2.424	86.950	1733.445	3085	29331
-4.746	86.720	1733.123	3086	29331
-7.125	86.483	1733.746	3087	29331
-9.339	86.259	1738.258	3088	29331
-11.657	86.021	1738.208	3089	29331
-14.001	85.777	1736.216	3090	29331
-16.490	85.510	1739.150	3091	29331
-18.617	85.277	1738.695	3092	29331
-21.250	84.979	1735.982	3093	29331
-23.808	84.679	1737.396	3094	29331
-26.114	84.397	1736.912	3095	29331
-28.733	84.062	1738.449	3096	29331
-30.901	83.772	1738.155	3097	29331
-33.481	83.408	1736.138	3098	29331
-35.797	83.061	1737.597	3099	29331
-38.191	82.681	1736.338	3100	29331
-40.165	82.347	1736.177	3101	29331
-42.442	81.935	1736.870	3102	29331
-44.771	81.482	1736.628	3103	29331
-47.035	81.003	1735.927	3104	29331
-49.356	80.466	1737.835	3105	29331
-51.447	79.937	1736.646	3106	29331
-53.953	79.233	1735.460	3107	29331
-56.210	78.520	1737.105	3108	29331
-58.673	77.636	1737.301	3109	29331

LATITUDE (DEG.)	LONGITUDE (DEC.)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-61.029	76.662	1737.047	3110	29331
-63.576	75.427	1736.560	3111	29331
-66.142	73.926	1736.856	3112	29331
-68.154	72.509	1738.154	3113	29331
-70.544	70.446	1738.165	3114	29331
-72.769	68.004	1739.698	3115	29331
-75.304	64.276	1739.955	3116	29331
-77.495	59.726	1738.545	3117	29331
-79.662	53.008	1739.765	3118	29331
-81.774	41.932	1737.593	3119	29331
-83.189	27.709	1742.259	3120	29331
-84.094	1.581	1740.948	3121	29331
-83.704	-23.272	1738.007	3122	29331
-82.409	-41.790	1737.128	3123	29331
-80.212	-55.778	1739.014	3124	29331
-77.356	-65.117	1739.253	3125	29331
-75.252	-69.418	1739.805	3126	29331
-72.591	-73.275	1739.314	3127	29331
-70.550	-75.493	1739.998	3128	29331
-68.063	-77.630	1740.080	3129	29331
-65.446	-79.414	1740.582	3130	29331
-63.009	-80.772	1739.988	3131	29331
-60.214	-82.067	1740.206	3132	29331
-57.746	-83.035	1738.560	3133	29331
-54.901	-83.996	1737.718	3134	29331
-52.166	-84.796	1737.569	3135	29331
-49.647	-85.448	1737.172	3136	29331
-46.898	-86.085	1737.634	3137	29331
-44.430	-86.602	1738.633	3138	29331
-41.766	-87.112	1739.323	3139	29331
-39.492	-87.514	1740.170	3140	29331
-37.140	-87.903	1740.982	3141	29331
-34.119	-88.367	1738.057	3142	29331
52.379	-85.003	1737.349	3061	99911
54.252	-84.436	1737.152	3062	99911
56.163	-83.800	1737.334	3063	99911
57.993	-83.127	1736.213	3064	99911
59.392	-82.562	1737.296	3065	99911
61.215	-81.751	1737.463	3066	99911
62.733	-80.997	1737.172	3067	99911
64.887	-79.778	1737.267	3068	99911
67.109	-78.288	1737.478	3069	99911
68.670	-77.058	1737.939	3070	99911
70.688	-75.172	1738.762	3071	99911
72.531	-73.059	1739.139	3072	99911

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
74.194	-70.713	1738.361	3073	9991I
76.019	-67.442	1739.733	3074	9991I
78.288	-61.771	1738.521	3075	9991I
80.173	-54.617	1737.802	3076	9991I
82.019	-42.849	1737.740	3077	9991I
83.364	-25.163	1737.505	3078	9991I
83.842	-1.303	1738.722	3079	9991I
83.219	21.751	1739.599	3080	9991I
81.558	40.238	1739.419	3081	9991I
79.345	51.864	1737.861	3082	9991I
77.070	58.813	1738.754	3083	9991I
74.254	64.335	1738.796	3084	9991I
71.479	68.036	1738.901	3085	9991I
69.068	70.433	1738.141	3086	9991I
66.522	72.425	1739.756	3087	9991I
63.737	74.171	1736.168	3088	9991I
60.965	75.586	1736.536	3089	9991I
58.239	76.749	1735.667	3090	9991I
55.742	77.663	1736.239	3091	9991I
53.182	78.483	1736.239	3092	9991I
50.455	79.254	1735.228	3093	9991I
47.409	80.013	1738.657	3094	9991I
44.400	80.679	1738.422	3095	9991I
41.424	81.272	1737.954	3096	9991I
38.595	81.786	1739.283	3097	9991I
36.017	82.219	1739.229	3098	9991I
33.470	82.619	1737.355	3099	9991I
30.571	83.046	1737.042	3100	9991I
28.381	83.351	1736.248	3101	9991I
25.937	83.676	1737.450	3102	9991I
23.329	84.008	1737.274	3103	9991I
20.387	84.366	1735.030	3104	9991I
17.767	84.674	1735.317	3105	9991I
15.129	84.973	1735.126	3106	9991I
12.528	85.260	1735.225	3107	9991I
10.177	85.514	1736.029	3108	9991I
7.731	85.774	1736.404	3109	9991I
5.373	86.021	1736.681	3110	9991I
2.782	86.291	1733.686	3111	9991I
-2.136	86.797	1733.284	3112	9991I
-4.746	87.066	1733.590	3113	9991I
-7.549	87.356	1734.981	3114	9991I
-10.103	87.623	1738.714	3115	9991I
-12.726	87.901	1737.330	3116	9991I

LATITUDE (DEG)	LONGITUDE (DEG)	RADIUS VECTOR (KM)	MEASUREMENT NO.	PLATE NO.
-15.368	88.187	1737.165	3117	9991I
-18.041	88.482	1739.599	3118	9991I
-20.759	88.792	1737.163	3119	9991I
-23.216	89.081	1737.527	3120	9991I
-25.477	89.356	1737.120	3121	9991I
-27.998	89.675	1736.207	3122	9991I
-30.347	89.985	1736.372	3123	9991I
-32.805	90.326	1735.239	3124	9991I
-35.014	90.648	1736.089	3125	9991I
-37.327	91.004	1735.457	3126	9991I
-39.829	91.414	1735.623	3127	9991I
-42.104	91.813	1735.862	3128	9991I
-44.414	92.249	1735.626	3129	9991I
-46.925	92.762	1737.303	3130	9991I
-49.116	93.251	1737.170	3131	9991I
-51.610	93.863	1737.381	3132	9991I
-53.911	94.491	1735.807	3133	9991I

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